GENERAL LIBRARY
JUN 9 1919
UNIV. OF MICH.

# The Journal of HEREDITY

*A monthly publication devoted to Plant Breeding Animal Breeding and Eugenics*

APRIL, 1919

Vol. X, No. 4

THE FOUNDERS OF THE ART OF BREEDING II
A UNIFOLIOLATE MUTATION IN THE ADZUKI BEAN
HEREDITY AND DEMOCRACY
ARISTOCRACY AND POLITICS
A FOSSIL EAR OF MAIZE
DOMESTICATION OF ANIMALS IN PERU
THE RACIAL LIMITATION OF BOLSHEVISM

ORGAN OF THE
AMERICAN·GENETIC·ASSOCIATION
WASHINGTON · D.C.
*Printed for Circulation among Members only*

Acceptance for mailing at the special rate of postage provided for in section 1103, Act of October 3, 1917 authorized December 20, 1918.

## WHAT GENETICS IS

**"An exact determination of the laws of heredity," says William Bateson, "will probably work more change in man's outlook on the world, and in his power over nature, than any other advance in natural knowledge that can be clearly foreseen."**

To gain this knowledge is the object of the science of genetics, which proceeds, in practice, largely by means of plant breeding and animal breeding for the reason that heredity is less complicated in these organisms than in Man, and its operation can be more easily made out. The knowledge so gained finds its application in methods for the improvement of cultivated plants and domesticated animals and, most important of all, in the improvement of the human race through the science of eugenics, which was defined by its founder, Francis Galton, as "the study of agencies under social control that may improve or impair the racial qualities of future generations, either physically or mentally."

## THE AMERICAN GENETIC ASSOCIATION

is an incorporated organization, coöperative in nature. It is devoted to promoting a knowledge of the laws of heredity and their application to the improvement of plants, animals, and human racial stocks.

It owns the JOURNAL OF HEREDITY, which is published monthly and sent free to each member.

## REQUIREMENTS FOR MEMBERSHIP

Membership is composed of men of science, teachers, publicists, physicians, clergymen, parents, students, horticulturists and breeders of live stock, etc., throughout the world.

Subject to the approval of the council, any person interested in the improvement of the human race or the creation of better varieties of plants and animals, is eligible for membership.

The secretary will be glad to correspond with those interested, and to send a copy of the magazine for examination.

Annual dues, giving the right to attend all meetings and receive the JOURNAL OF HEREDITY, are $2; life membership is $50.

**If you want to become a member, or if you know anyone who you think is eligible for membership, write to**

**THE AMERICAN GENETIC ASSOCIATION**

**P. O. Box No. 472, Eleventh Street Station Washington, D. C., U. S. A.**

*The*

# Journal of Heredity

(Formerly the American Breeders' Magazine)

Vol. X, No. 4 April, 1919

## CONTENTS

The Founders of the Art of Breeding—II, by Herbert F. Roberts ..... 147
A Unifoliolate Mutation in the Adzuki Bean, by A. F. Blakeslee ..... 153
Breeding Milk Goats, by J. W. Thompson ..... 157
Heredity and Democracy, by Edwin G. Conklin ..... 161
Discussion of Article on Democracy and Heredity, by Madison Grant 164
Aristocracy and Politics, by Prescott F. Hall ..... 166
Plant Breeder's Envelope, by Robert L. Davis ..... 168
A Fossil Ear of Maize, by G. N. Collins ..... 171
The Fighting Ability of Different Races, Second Letter ..... 173
A Wingless Wyandotte, by J. R. Terry ..... 175
Domestication of Animals in Peru, by O. F. Cook ..... 177
Do Birds Show a Monogamous Instinct? ..... 181
Twinning in Alfalfa, by W. Southworth ..... 182
A Forage Plant from the Solanacae Family, by B. H. Hunnicutt 185
The Racial Limitation of Bolshevism, by F. A. Woods ..... 188
The Inheritance of Continuous and Discontinuous Variations .... 191

**NOTE**

Instead of raising the price of membership, and in order to meet the requirements of the War Industries Board, and also because of the drafting of the whole Editorial Staff the July, August and September numbers have been dropped out for 1918. Vol. IX contains only 8 instead of 12 numbers.

The Journal of Heredity is published monthly with the exception of July, August and September by the American Genetic Association (formerly called the American Breeders' Association) for the benefit of its members. Canadian members who desire to receive it should send 25 cents a year, in addition to their regular membership dues of $2, because of additional postage on the magazine; foreign members pay 50 cents extra for the same reason. Subscription price to non-members, $2.00 a year, foreign postage extra; price of single copies, 25 cents.

Entered as second-class matter February 24, 1915, at the postoffice at Washington, D. C., under the act of August 24, 1912. Contents copyrighted 1918 by the American Genetic Association. Reproduction of articles or parts of articles permitted provided proper credit is given to author and to the Journal of Heredity (Organ of the American Genetic Association), Washington, D. C.

Date of issue of this number, May 26, 1919.

J. Cederquist ad lithographiam autot.

**KOELREUTER, THE FIRST SCIENTIFIC PLANT BREEDER**

In 1760 Koelreuter produced the first plant hybrid ever obtained in a scientific experiment. (Frontispiece.)

# THE FOUNDERS OF THE ART OF BREEDING—II

**Work of the Earlier Hybridists—Other Great Discoverers Long Neglected, as Was the Case with Mendel**

HERBERT F. ROBERTS
*Kansas State Agricultural College*

IN A previous article,[1] the writer described the early work in plant breeding, which came about through the accidental contact of the people of Mesopotamia with the date palm, the discovery thereby of the fact of sex in plants, which underlies breeding, and Camerarius' scientific investigations upon plant sex. The present article deals with the work of some of the earlier hybridists, whose experiments determined the course of the art of plant breeding before Mendel's time.

## KOELREUTER, THE FIRST SCIENTIFIC PLANT BREEDER

Camerarius' now famous Latin letter fell on sterile, or rather on unprepared soil. Over half a century had to pass by before one was found to speak his praise. "Rudolf Jacob Camerer is indisputably the first who proved the sex of plants through his own experiments, instituted with this idea in view. . . . In this manuscript (the letter to Valentin), which far surpasses in thoroughness, completeness and good execution, almost all the writings of this nature which have thus far come to light up to the present day, he appeared to have at once exhausted everything which might have been said on the subject up to his time." These were the words of Joseph Gottlieb Koelreuter: From the 25th of August, 1694, when Camerarius wrote his letter concerning his experiments upon sex in plants, until September 1, 1761, there had been no real progress in the scientific knowledge which underlies plant breeding. On this latter date, however, appeared Koelreuter's "Preliminary Report of some Experiments and Observations concerning Sex in Plants"(4). This report, followed in 1763, 1764, and 1766, by three additional papers on the same subject, record the results of 136 distinct experiments in the crossing of plants.

If Camerarius made the actual scientific discovery of sex in plants, Koelreuter was the first to apply this discovery to their scientific breeding. Koelreuter was born April 27, 1733, in the Swabian village of Sulz, in the valley of the Neckar, in the Black Forest region of southwest Germany. He conducted his experiments partly in his native village, partly in the garden of a physician in the town of Calw in Württemberg, and partly in St. Petersburg, Berlin, and Leipzig. From 1764, until his death in 1806, he was Professor of Natural History in the University of Karlsruhe. At Sulz, in 1760, Koelreuter produced the first plant hybrid ever obtained in a scientific experiment.

## THE FIRST "MULE" PLANT

In Koelreuter's quaint German, we read of the reasons which led him to experiment upon the breeding of plants. He calls attention to the fact that man has brought together into botanical and zoölogical gardens, plants and animals from all quarters of the earth. With animals, this has given rise to the possibility of making hybrids. "Would a goldfinch ever have mated with a

[1] JOURNAL OF HEREDITY, vol. x, p. 99.

canary bird, and have produced hybrid offspring," he naïvely comments, "if man had not furnished them the opportunity to come to know each other more intimately?" He then goes on to remark upon the possibility of plant hybrids having been similarly produced in botanic gardens, between related plants, which had thus been brought into accidental proximity to one another and says:

"Because I was long since convinced of the sexuality of plants, and had never doubted the possibility of such an unnatural procreation, I, therefore, let myself be deterred by nothing from instituting experiments on the subject, in the good hope that I might perhaps be so fortunate as to bring into existence a hybrid plant. After many experiments carried on in vain with several kinds of plants, in the past year, 1760, I got so far in the case of two different species of a natural group, *Nicotiana paniculata* and *Nicotiana rustica*, that I fertilized with the seminal dust (pollen) of the former, the ovaries of the latter, obtained perfect seeds, and from these, in the very same year, have raised young plants."

Some twenty of these hybrids came to maturity, and were found to occupy an almost exactly intermediate position between the two parents, with respect to all of their characters examined. Unfortunately, these hybrids were completely sterile, and Koelreuter adds this odd remark: "This plant is thus in a real sense, an actual, and so far as is known to me, the first botanical mule which has been produced by art."

Koelreuter made, besides other crosses between species of Nicotiana, crosses between species of Kedmia, pink (*Dianthus*), stocks (*Matthiola*), dogbane (*Hyoscyamus*) and burdock (*Verbascum*). He ascertained the fact, that in general only nearly related plants, and not always even these, can be crossed. He determined experimentally the fact that if the stigmas of flowers are pollinated at the same time by their own and by pollen from another species, that fertilization is effected by the former, which would account for the comparative rarity of "species hybrids" in nature. Koelreuter also made the very important discovery, the explanation of which was not furnished until much later, that the continued self-pollination of hybrids finally results in the re-appearance of the original parental forms.

His ideas regarding fertilization are interesting. He thought that a plant was formed by the fusion of two fluid materials of different sorts. The prepotence of the one parent over the other, where it occurred, was ascribed to the fact that, "since these materials are of different sort, or in their essence are different from each other, it is easy to comprehend that the strength of one must be different from the strength of the other."

### MISCELLANEOUS EXPERIMENTS REGARDING SEX IN PLANTS

Camerarius and Koelreuter stand as the two great landmarks in the history of scientific plant breeding up to 1766. While these two were the only investigators whose contributions to our knowledge of sex in plants were extensive or fundamental, it is of interest to know that the first person who is reported to have actually crossed plants artificially, was an Englishman named Thomas Fairchild, who, according to Bradley (1, p. 16), crossed two kinds of pinks in 1719. The cross in question was known still to gardens, one hundred years later, as "Fairchild's Sweet William," nevertheless, as Focke says (p. 430): "This success in artificial fertilization was never utilized for science, nor does it appear to have given gardeners any stimulus to further investigations."

Two years earlier than this, Bradley himself (1, p. 20) had removed the anthers from the flowers of twelve tulips which he had planted in a remote place in his garden, and had found that they produced no seeds, while some four hundred tulips planted elsewhere in the garden and left intact, produced seeds freely.

Twenty years later, in 1739, James Logan, an American citizen of Irish birth, and at that time governor of

Pennsylvania, published in Latin (5), an account of his experiments with Indian corn, or maize. In each of the four corners of a plot of ground forty by eighty feet in size, he planted Indian corn. The plants in one corner, being detasseled, produced no seeds. From certain ears, he removed part of the silks, and found that only those grains to which the silks were left attached, became fertilized, and grew to maturity. He also wrapped one ear in cloth before the silks appeared, with the result that no seeds whatever were produced.

"In 1731, Philip Miller, in the first edition of his "Gardeners' Dictionary" (6) reported his own repetition of Bradley's experiment with tulips, as follows:

"I set twelve tulips by themselves, about six or seven yards from any other, and as soon as they blew, I took out the stamina with their summits so very carefully that I scattered none of the male dust; and about two days afterwards I saw bees working on a bed of tulips, where I did not take out the stamina; and when they came out, they were loaded with the Farina or male dust on their bodies and legs; and I saw them fly into the tulips, where I had taken out the stamina, and when they came out, I found they had left behind them sufficient to impregnate these flowers, for they bore good ripe seeds which afterward grew."

Miller also grew male and female plants of spinach apart, and found that the latter bore seeds which contained no embryos.

In 1751, Gleditsch, Director of the Berlin Botanical Garden, published an account (3) of an experiment in crossing a species of palm (*Chamaerops humilis*), of which Sachs says in his History of Botany, "This treatise, in point of its scientific tone and learned handling of the question, is the best that appeared between the time of Camerarius and that of Koelreuter."

Gleditsch had a pistillate palm in the botanical garden in Berlin, which, although some eighty years old, had never borne fruit. There was a male tree of the same species in a garden in Leipzig. In the spring of 1749 he obtained from this tree a quantity of pollen, which arrived in Berlin nine days later, a journey which today requires two and one-quarter hours. In consequence of the long journey, most of the pollen had fallen out of the withered staminate flowers. Nevertheless he pollinated the female flowers with the loose pollen, and was rewarded by seeing fruit ripen and produce seeds, which germinated in the spring of 1750.

This sketches briefly all of the important experiments known to have been performed in connection with the investigation of sex in plants, between the days of Camerarius and Koelreuter. By the middle of the eighth century, therefore, little doubt should have remained in scientific minds regarding the existence of sex in plants, or as to the necessity of the pollen as a fertilizing agent. Moreover, actual experiments in fertilization, many of them between plants of different species, had been successfully carried out in more than twenty important groups of plants, from many different families. We have also, in Koelreuter's work, a careful study of the characteristics of hybrids, obtained in sixty-five different hybridization experiments, conducted with species from a dozen different genera, belonging to diverse families, together with an accurate comparison of the characters of the hybrid plants of the first generation with those of their parents.

A scientific foundation was therefore laid at last for the breeding of plants. The value of Koelreuter's experimental work was doubted, however, by influential contemporary critics, although Sagerer (7), whose opinion should have carried weight, said of Koelreuter: "Having several times repeated his experiments I have had occasion to convince myself more and more of his exactitude and of his veracity; I believe then that he merits all confidence." It was the fate, therefore, of Koelreuter as of Camerarius, to remain practically unknown and unheeded by his own generation, and to exert no influence whatever upon the theory and practice of his day.

Despite, however, the fact that Koelreuter had demonstrated the possibility

**TITLE PAGE OF A GREAT CLASSIC**

Title page of the first edition of "Sprengel's Secret of Nature," in which he reveals his discovery of insect fertilization. (Fig. 1.)

of crossing plants artificially, and had even laid the foundations for a knowledge of the laws governing hybrids, much doubt still remained in the minds of botanists, regarding the facts which Camerarius' and Koelreuter's experiments demonstrated. As Sachs remarks. "The plant collectors of the Linnaean school, as well as the true systematists at the end of the eighteenth century, had little understanding for such labors as Koelreuter's."

Gärtner says, writing in 1849 (2, p. 5): "Hybridization in its scientific significance was so little thought of, and, at the most, regarded merely as a proof of the sexuality of plants, that the many important suggestions and actual data which this diligent and exact observer recorded in various treatises have found but little acceptance in plant physiological papers up to the most recent times. On the other hand, even in respect to the sexuality of plants, they were attacked to such a degree, that their genuineness was doubted and strenuously contradicted, or else they were regarded as a sort of inoculation phenomenon belonging to gardening." Such is the usual history of scientific progress.

### THE REVELATIONS OF SPRENGEL

While Camerarius had demonstrated the fact that plants possess sex, and Koelreuter had shown that fertile hybrids could be produced between plants of different kinds, the further fact that crossing in nature, at least among different individuals of the same species, is a common and ordinary phenomenon in the plant kingdom, was not at all known. Aware, as we are today, that the improvement of cultivated plants, due to the appearance of new strains and varieties, is to be accredited largely to the natural crossing of individuals standing in fairly close relationship to one another, we can see the importance to plant breeding, of the next great discovery, that flowers are commonly pollinated by insects, and that there is an intimate inter-relationship between the plant and the insect world.

Christian Konrad Sprengel (1750–1816), published in 1793 (8), an epoch-making book, "The Newly Revealed Secret of Nature in the Structure and Fertilization of Flowers," which constitutes the third great landmark in plant breeding, after the original discovery of plant sex by the Asiatic date breeders in the unknown past. It was Sprengel's chief contribution, to discover the fact of insect fertilization. Such a wealth of accurate, first-hand observations on the adaptations of flowers to cross pollinations, had never before been made. To Sprengel also is due the discovery of dichogamy, *i. e.*, the maturing of the stamens and pistils of flowers at different times. His conclusion, that nature in most cases, intended that flowers should not be fertilized by their own pollen, and that the peculiarities of flower structure can only be understood, when studied in relation to the insect world, was revolutionary for his time. "Here was the first attempt to explain the origin of organic forms from definite relations to their environment."

### THE SIGNIFICANCE OF SPRENGEL'S DISCOVERY TO PLANT BREEDING

Conceding the fact that plants actually have sex, it is plain that some kind of breeding must be possible. Granting that hybrids, even between different species, can be produced, it is further plain that new kinds of plants can be originated. But what of the additional fact—the contribution of Sprengel—that in general, nearly all flowering plants with definite floral envelopes are naturally cross-fertilized. It means simply this, that the bringing together of new combinations of parental characters is the rule rather than the exception in nature, and that, therefore, the breeding of new types in the plant world may be said to be going on all of the time. It remained for Darwin to show how the results from such perpetual crossings are limited and held in check by the operation of natural selection. At all events, Sprengel's discoveries at once disclosed at least an important reason for the diversity—the existence of so many variations in nature, upon

which fact man had depended for the selection of "superior" types of plants, and hence for the "improvement" of plant races.

But, unfortunately, these discoveries and disclosures of Sprengel's awakened little interest at the time. Like Camerarius and Koelreuter, Sprengel, in turn, was a stone that the builders rejected. Biologists of his day believed in the dogma of the fixity of species, to which Koelreuter's experiments in the making of hybrids, and Sprengel's epoch-making discoveries regarding cross-pollination by means of insects, were directly contradictory.

## THE OPENING OF A NEW ERA

The beginning of the nineteenth century marks the beginning of a new era in plant breeding, initiated by the work of the English breeders and naturalists, Andrew Knight and William Herbert, and of the celebrated German hybridizer, Carl Friedrich von Gärtner. Through the extensive and intelligent experimentation of these men, the fact of sexuality in plants was emphasized, and the inauguration of the era of practical plant breeding was effected. Although the scientific world of today traces a continuity of thought and investigation from Gärtner back to Camerarius, the fact must not be lost sight of, that each of the three great investigators who laid the foundations of plant breeding—Camerarius, Koelreuter, and Sprengel—was completely ignored by, and practically unknown to, the biological science of his own time. The torch of discovery was not passed from hand to hand, but was lighted, as it were, three separate times.

Two human generations elapsed from the work of Camerarius to that of Koelreuter, and one generation from Koelreuter to Sprengel. It is more than another generation from Sprengel's publication to the time of the best work of Herbert (1837). It is a third of a generation more to the appearance of Gärtner's memoir (1849), and about half of another generation more to the appearance of Mendel's epoch-making and now celebrated papers (1866), and more than another generation again to the date of the final rediscovery of Mendel's work (1900), the beginning of the Mendelian or scientific age of plant breeding, which ushered in the era of the development of what we call the science of "genetics."

## BIBLIOGRAPHY

Literature pertaining to sexuality in plants, and to hybridization, from Koelreuter (1760), to Sprengel (1793).

1. Bradley, Richard, New Improvements of Planting and Gardening, Sixth Ed. London, 1719.

2. Gärtner, Carl Friedrich von, Versuche and Beobachtungen uber die Bastarderzeugung im Pflanzenreich, Stuttgart, 1849.

3. Gleditsch, Johann Gottlieb. (*a*) Essai d'une fécondation artificielle, fait sur l'espèce de palmier qu'on nomme *Palma dactylifera folio flabilliforme.* Histoire de l'Académie royale des sciences et des belles lettres de Berlin, 1749. Pp. 103–108, 1751. (*b*) Rélation de la fécondation artificielle d'un palmier femelle, réitérée pour la troisième fois, et avec un plein succes, dans le Jardin botanique, de Berlin. Histoire de l'Académie royale des sciences et des belles lettres de Berlin, 1767, pp. 3–19, 1769.

4. Koelreuter, Joseph Gottlieb, (*a*) Vorlãufige Nachricht von einigen, das Geschlecht der Pflanzen betreffenden Versuchen und Beobachtungen, nebst Fortsetzungen 1, 2, and 3 (1761–1766); edited by W. Pfeffer, as No. 41 in Ostwald's "Klassiker der Exakten Wissenschaften." Leipzig, 1893. (*b*) Histoire der Versuche über das Geschlecht der Pflanzen, in Miken's "Opuscula Botanici Argumenti."

5. Logan, James, (*a*) Experimenta et meletemata de plantarum generatione. Lugduni Batavorum, (Leiden), 1739. (*b*) Experiments and considerations on the generation of plants. Second edition of above. English and Latin on opposite pages, and with both English and Latin title page. London, 1747.

6. Miller, Philip, Gardener's Dictionary, Extract quoted, found in the following editions. 1st Ed. 1731, 6th (folio), 1752, 7th, 1759. Extract in text taken from edition of 1759, unpaged, in article entitled "Generation" toward the end of the volume.

7. Sprengel, Christian Konrad, Das Entdeckte Geheimniss der Natur, im Bau und in der Befruchtung der Blumen, 1793. Ed. by Paul Knuth. In Ostwald's Klassiker der Exakten Wissenschaften, No. 48. 4 vols., Leipzig, 1894.

# A UNIFOLIOLATE MUTATION IN THE ADZUKI BEAN

A. F. Blakeslee

*Station for Experimental Evolution, Cold Spring Harbor, Long Island, N. Y.*

THE Adzuki Bean (*Phaseolus angularis*), like other members of the genus Phaseolus to which our common beans belong, is trifoliate. Although the first pair of leaves above the cotyledons are simple, those later formed are regularly compound each with three leaflets. Occasional abnormalities in individual leaves, it is true, may be found, and the writer has record of a seedling plant with but a single simple leaf which was unable to continue growth on account of the lack of buds. So far as the writer is aware, however, a full-grown Adzuki Bean plant with all its leaves simple has only once been observed. In view of the number of plants of this species that have been under close observation for a considerable length of time, it seems worth while to make a brief record of this occurrence.

The plant on the right in Fig. 2 is shown beside a normal individual from the same pedigree. Unfortunately the photograph was not taken till late in the season when the foliage was in an imperfect condition. A typical unifoliolate leaf isolated from this plant is shown on the background at the right in contrast with a typical trifoliate leaf on the extreme left from the normal plant. The mutant plant was somewhat taller than its neighbors in the same pedigree, was more branched and retained its leaves longer. In fact it was difficult when the photograph was taken to find a normal plant that had not lost most of its leaves. These peculiarities in habit may be due to the fact that the plant was entirely sterile, and vegetative functions in consequence were not checked by the production of fruit. Buds were formed in densely packed spikes giving promise of abundant flowers. No fully formed flowers, however, ever developed. The buds all dropped at an early stage before the petals were visible. As the dropping proceeded from the base upwards, the axis of the cluster progressively elongated and thickened. These floral clusters may be seen projecting from the plant in many places. They show the terminal clusters of young buds and the elongated axes studded with warty scars that mark the places from which buds have fallen.

The unifoliate plant was the only one of its kind in a row of some 1,500 plants grown in 1918. The parents of this pedigree were the offspring of a single select plant grown in 1918. The line from which the mutant arose came from a single plant grown in 1913. The descendants of this original plant, including a number of sublines, comprise 2,672 individually counted plants in addition to about 4,700 plants not actually counted although grown under close inspection. It is safe to say, therefore, that the mutant in question was the only one of its kind in an inbred line comprising around 7,400 individuals. Moreover, no unifoliolate plant has been observed in rather extensive plantings of Adzuki Beans of various other lines. In 1917 all the plants in the field, numbering 42,174 individuals, were under close observation and frequent records were taken of them in regard to time of flowering and maturity of pods. In 1918, select pedigrees comprising around 74,100 individuals were likewise repeatedly inspected for flowering and maturity. All the plants grown in the field in 1917 and the select pedigrees of 1918 were so frequently inspected that it

**UNIFOLIOLATE MUTATION IN THE ADZUKI BEAN**

The Adzuki, like most common beans, is trifoliolate as shown in the smaller plant at the left. A typical unifoliolate leaf isolated from the mutant is shown on the background at the right in contrast to a typical trifoliolate leaf on the extreme left. This mutation may be in the nature of a reversion. (Fig. 2.)

seems improbable that such a striking variation as the one photographed could have escaped notice. The same is true of 5,938 plants grown in the greenhouse. A total, then, of over 122,000 plants were grown under close observation without showing another mutant of this kind.

Since the simple-leaved form is sterile and moreover retains its leaves in the fall after other plants have become defoliated, it is a conspicuous object at time of harvest. If such a plant had been present in the 228,000 and more individuals grown in multiplication pedigrees in 1918, it would have stood good chance of being discovered at harvest, although these multiplication pedigrees were not so often nor so closely inspected during the growing season. It is not entirely improbable, therefore, that the mutant occurred only once among over 450,000 plants which were kept under more or less strict observation.

Numerous varieties of the Adzuki Bean have been introduced and grown in trial plats by the department of Forage Crop Investigation of the U. S. Bureau of Plant Industry during the last twenty years. Dr. C. V. Piper and Mr. W. J. Morse, who have had charge of the tests in this department, report that they have never seen a plant of the Aszuki Bean with unifoliolate leaves.

Another representative of the genus Phaseolus (*P. Vulgaris*) has been studied by Dr. J. Arthur Harris in reference to the occurrence of abnormalities in the seedlings. He has kindly informed the writer that only once has he found plants with unifoliolate leaves. Three individuals in a pedigree, the offspring from a single parent, had undivided leaves and were otherwise abnormal. Outside of this single pedigree, none of the several million plants of the pea bean individually examined for abnormalities was found with simple leaves.

The Legumenosae are predominately characterized by compound leaves. In a few genera, however, the leaves are simple. As familiar examples of the latter condition may be mentioned the Redbud (*Cercis*), the Rattlebox (*Crotolaria*) and the Dyer's Greenweed *Genista*). In Rhynchosia, typically a trifoliolate genus, one species (*R. simplex*) has only unifoliolate leaves. These facts may suggest that in the evolution of the Leguminosae the present predominately compound foliage has been derived from a simple-leaved condition. Such a supposition might be supported by the genus Bauhinia, which apparently shows various stages in the process of conversion of a simple to a compound leaf by progressive furrowing between lobes. The unifoliolate representatives of the family might, therefore, be considered arrested stages in evolution or reversions to an ancestral type. Under this interpretation, the mutation under discussion would be in the nature of a reversion. It must not be denied, however, that some may prefer to read the evolutionary trend in the reversed direction and to consider the mutation a progressive one.

All the facts presented show that the unifoliolate type here reported for the Adzuki Bean is an extremely rare variant. Despite the fact that its inheritance could not be established by breeding experiments, it has been called a mutation. Its failure to appear more than once in so large a number of individuals indicates that it is a variation genotypic in nature, since it could scarcely be attributed to the reappearance of a character through normal segregation nor be considered a mere modification induced by environmental factors.

# BREEDING MILK GOATS

## Anglo-Swiss and Egyptian Breeds Are Popular in the United States—The Industry a Profitable one—Distinctive American Breed Is Needed

J. W. THOMPSON

*Ex-Editor "Spirit of the West," "Stock Farm," Etc.*

IT IS obvious that a new source of milk supply is rapidly becoming a necessity in this country. Various causes are bringing it about. One is the speedy multiplication of densely inhabited cities and towns, with population so closely crowded as to preclude, largely, the keeping of the cumbersome and unsanitary family cow. Another is, failing lands, both in area and productiveness, with increased high cost of feed, of all sorts, for maintaining extensive dairies to supply milk at a price not prohibitive to average households. A third cause is the menace of tubercular affection in the bovine species, with other infections and impurities connected with dairying institutions, defying all efforts successfully to correct or remove them.

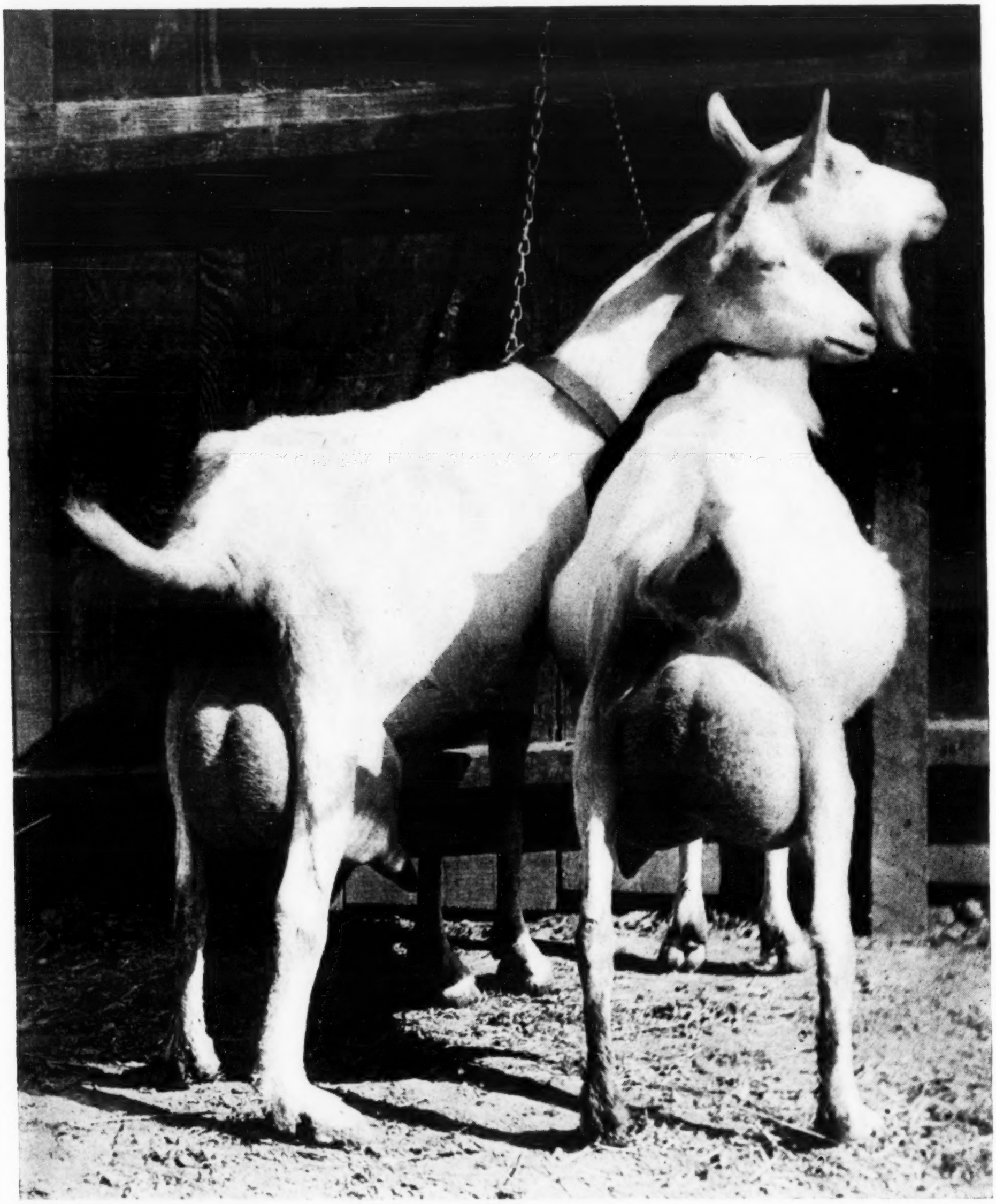
Casting about for a substitute, none other appears, on the whole, to present as many and strong claims to take the place as the genus Capra, the animal first employed by mankind to supply the earliest and most wholesome of all goods.

### A MODERN IMPROVED TYPE

A vastly improved variety has been developed in recent years, manifesting capacity and possibility in milk production of very high order. The orient has led off in this, as in the first domestication of the animal, and is the source from which this country has to derive its foundation stock. Upper Egypt, Abyssinia and Nubia have developed what is known as the Nubian breed, which, modified by a cross with natives in England, has given the Anglo-Nubian largely in use in that country. Switzerland has evolved three distinct varieties, the Toggenburg, the Saanen and the Guggisberger, which, with the Maltese, found in the island of Malta, comprise practically all entitled to the claim of special adaptation. This country has lagged far behind in developing an industry productive of the kind, making the first importations worthy of mention less than a score of years ago, and on the menace of the "foot and mouth disease," putting a ban on the further import of all animals liable to prove carriers of the dreaded germs. A limited number of pure-bred descendants of those brought in, with the class of grades resulting from crosses made with the native stock, compose the total holdings up to the present, so scant that the limited number of enthusiastic breeders and owners are combining in an effort to induce the Government, under its own agency, to procure additional stock of each of the established breeds from the forbidden lands across the sea.

### MILK-PRODUCING VALUE

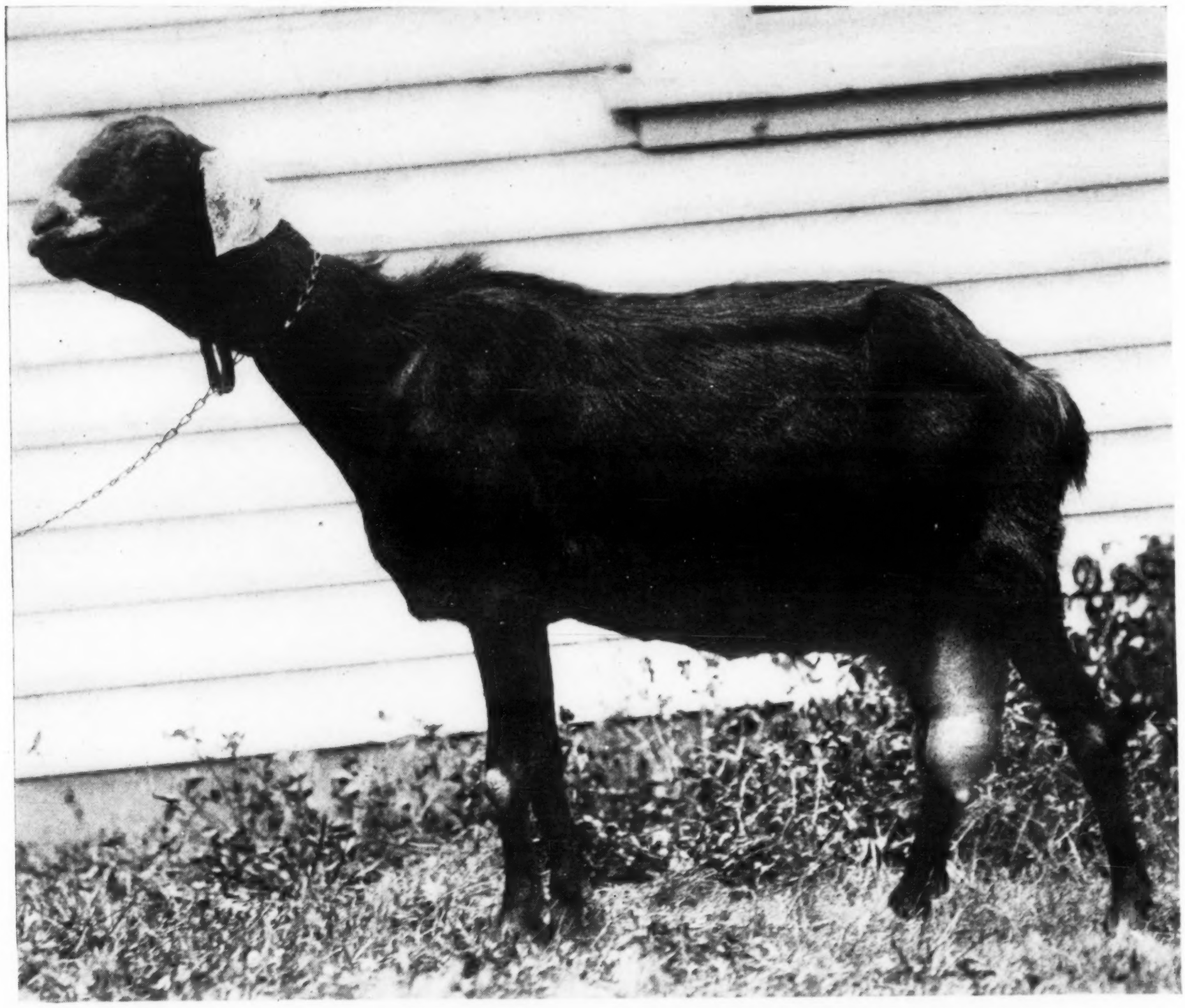
The capability of the high-bred class to produce milk in quantity and quality encouraging a general introduction is sufficiently well established to convince the most sceptical, while even the better specimens of grades of relatively low order show up in an astonishing manner. A test made at the farm of the California Agricultural College, of a grade Toggenburg doe, showed a milk yield, in 365 consecutive days, of 2,914 pounds, and the conclusion of numerous experiments made by the same institution is, that average does of the sort can be largely bred, yielding 3 to 4 quarts per day for a lactic period of eight to ten months. The flavor of the



**TWO PURE-BRED SAANEN DOES**

This is one of the three varieties developed in Switzerland. The other two are the Toggenburg and Guggisberger. The does shown in this picture have milked more than 14 pounds per day each. Courtesy of *The Goat World*. (Fig. 3.)

milk is pronounced virtually identical with the best from the cow, indistinguishable in our experience, and in richness, on the average, superior, about equivalent to what is termed 'thin cream.' Its wholesomeness is, however, much more strongly insisted upon by numerous authorities, including physicians, chemical analysts and experts of various sorts. Particularly has its



**PURE-BRED ANGLO-NUBIAN GOAT**

This cross between the Nubian of Africa and the native English is largely in use in England. This doe has a record of more than 5 quarts daily for a long period. Courtesy of *The Goat World*. (Fig. 4.)

worth been proven in the case of delicate and failing infants, surpassing any known preparation as an artificial food for babes not nurtured at the mother's breast, and, likewise, for the aged, infirm and ailing, having almost a remedial virtue in many instances; while as an article for general use, in addition to its superiority in other food elements, its supreme excellence lies in the fact of the large preponderance it possesses, over other milks in use, in the life-giving property of vitamines.

### FREEDOM FROM DISEASE GERMS

The long-reputed freedom of the hircine tribe, comparatively with all other domestic animals, from tubercular and other disease germs, appears to be well authenticated. From time immemorial the reputation of this mountain ruminant for general hardiness and healthfulness has been universally conceded, its very presence with other animals being popularly believed to have a preventive, if not curative effect, in the case of many ailments. Although not proven absolutely immune to the fatal malady of tuberculosis, yet the goat tribe, as a whole, has been found virtually proof against invasion by its fearful virus, even inoculation with it, in tests made, being effectually resisted.

**PURE-BRED TOGGENBURG DOES**

These, with the Guggisberger and Saanen (Fig. 3), form the standard Swiss breeds. America has not yet developed a distinctive breed. These five goats were giving 49 pounds of milk daily when the picture was taken. Courtesy of *The Goat World*. (Fig. 5.)

Climaxing the claims to be put forward in its favor is consideration of economy. First is the small space into which it may be cramped and the consequent cheap housing, covering all exactions in two particulars, so difficult to provide for in the instance of the more gross and untidy cow. The back yard, at command of most households, and a kennel such as is often provided for the children's pet dog, will suffice, while the unusual freedom from odor of the doe, with its exceptional cleanliness, fits it for close proximity to residences or other buildings, and its docility permits its use for the children's pet. Again, no other discovered domestic animal that could fill the place can be fed at as small an outlay. In quantity of feed, careful computations figure on one-eighth of what is required to maintain a cow in like condition. In actual cost, this amount may be indefinitely reduced in the vast majority of instances. Tethering out in summer on lawns, road sides, vacant lots, etc., will be found feasible, frequently sustaining entirely for an extended period. The weeds and waste from gardens, peelings and discarded vegetables, with scraps from the table, will furnish another large portion of acceptable provender. Then the class of feed to be purchased may be of the cheapest order of forage and mill products, articles which the goat relishes as no other domestic animal.

The sale of kids produced, and the meat and pelt value, which have been the chief revenues derived from handling the common goat, have not been mentioned—left entirely as "velvet."

A main obstacle to a wide ownership in this country, aside from shortness of

supply, is the price demanded, making a truly desirable doe, instead of the "poor man's cow," the "rich man's luxury."

Richly pedigreed, tested does command figures running well up into the hundreds, the record price having been set at the Liberty Fair in Los Angeles, California, the first days of the present year, in the sale of the Toggenburg, Princess Louise, No. 739 A.M.G.A., yielding 6¼ quarts of milk in twenty-four hours, and producing fourteen kids in her four kiddings, for $700. Fairly good producing grades sell for from $50 to $75, while top males bring from $200 to the record of $1,000. Lower grades, and young untried things, are vended all the way from $25 down to the price of market stock.

Such a state of affairs affords an attractive opportunity for progressive spirits to engage in the enterprise of breeding, handling and perfecting milk goats, up to the unlimited possibilities clearly attainable.

---

## Hermaphrodite Bees

One of the beekeepers in this district has just been telling me of a further development of the unusual experience he had with one of his colonies in 1917. During that year, and again in 1918, large numbers of malformed bees were thrown out of one of his hives. On making an examination of these bees as many as thirteen distinct and curious combinations were observed. Some of them had a worker eye on the left side of the head and a drone eye on the other, and some just the reverse. Others were perfectly formed drones as far as the petiole (the tube connecting the thorax with the abdomen), the abdomens from that point being in every way the same as workers, including the sting. Others again were just the reverse of this. These monstrosities all emerged from worker cells which were capped in such a peculiar manner that they could all be recognized before hatching out. There was apparently nothing radically amiss with the queen otherwise as the colony built up rapidly in the spring and swarmed early in the season. At this time five nuclei were made from the hive and now comes the remarkable and strange part of the story. All these nuclei have repeated the same phenomena as the parent colony, similar types of malformed bees having been thrown out of every one. Here, therefore is direct evidence of a well defined, although undesirable, trait, or characteristic, in a queen being transmitted to her next succeeding generation. A theory advanced, when the occurrence was first observed in 1917, was that possibly the old queen might have been mated with a drone emanating from a laying worker.—W. J. Sheppard, Nelson, B. C., *in British Columbia Farmer.*

---

## Families of the First-Born

Analyzing more than 20,000 individual histories in five American genealogies, Carl E. Jones (Quarterly Pubs., Am. Stat. Ass'n, December, 1918), finds that the first-born marry in the same proportion as other members of their families, and that when they marry they have on the average just as many children as do their sibs. He infers that, whatever the handicaps may be under which the first-born is alleged to labor, these handicaps are not of a character to interfere with his racial value. Mr. Jones extracts from his data a number of other conclusions, most of which are confirmatory of those secured by Alexander Graham Bell in his study of the Hyde family, parts of which have been presented in various issues of the Journal of Heredity.

# HEREDITY AND DEMOCRACY

## A Reply to Mr. Alleyne Ireland

EDWIN G. CONKLIN

I

IN SEVERAL addresses given during the course of the war and in an article in *Scribner's Magazine* for April, 1919, I have attempted to show that the principles of heredity and evolution are not opposed to the essential principles of democracy. In the JOURNAL OF HEREDITY for December, 1918, Mr. Alleyne Ireland comes to a directly opposite conclusion. Mr. Ireland speaks out of an experience of more than twenty-five years as a student of government in a score of countries "with a dozen governmental systems ranging between the extremes of the autocratic and of the democratic forms." As a result of this experience he concludes "that the best governed countries were those in which the mass of the people had the least control over the administration of public affairs. By 'best governed' I mean best provided with internal peace, with justice, with honest and competent officials, with protection for life, property, with freedom of individual action, with arrangements for promoting the general welfare."

This is a conclusion of such a startling character that it may well challenge the attention of students of government throughout the world. The facts upon which it is based need to be presented in greater detail, and if it is confirmed by further study it behooves the defenders of democracy to show that the evils of democratic government are not necessary evils or that they are more than compensated for by other advantages. As one who is only a casual student of government I shall not venture upon this task, but I cannot help wondering whether Mr. Ireland includes Russia under the Czars and Turkey under the Sultan or the "Committee of Union and Progress" among the best governed nations or whether he may not be thinking rather of British colonies in which a highly enlightened race rules over an inferior or primitive one.

No doubt it is generally better for parents to govern young children than to make them absolutely self-governing; no doubt races of superior intelligence and morality can govern primitive races more efficiently than they can govern themselves; no doubt a wise and beneficent autocracy can accomplish many desirable things which an ignorant and corrupt democracy cannot. The question which lies back of all this is, What is the purpose of government? In the case of children is it not to bring them to a condition where they can wisely govern themselves? Is the purpose different in the case of primitive races or of the masses in a democracy? Is not the chief aim of government the highest possible development of the individual, the nation and the race?

In all kinds of development and evolution progress depends upon increasing specialization and coöperation, and this is as true of human society as of anything else. As a nation we have only recently emerged from the pioneer condition in which there was little specialization and coöperation but such a condition is not a necessary part of democracy and our people are rapidly becoming more highly specialized and more intimately bound together without becoming less democratic. Many faults of democracies are not so much results of the form of government as of the condition and character of the people.

Lack of specialization is said to be one of the fatal faults of democracy. Mr. Ireland says that in all other affairs of life we demand specialists and experts but "in government we are asked to

submit expert control to the inexpert." But lack of specialization is no essential part of democracy. Specialists in all fields of human activity are developed in democracies no less than in other forms of government, and if in selecting men for public office we still retain some of our pioneer ideals this phase of our development is rapidly passing. No doubt we often make mistakes in choosing men for public positions, but do other forms of government avoid such mistakes? In a democracy these mistakes may be quickly remedied; when we become sufficiently aroused "we turn the rascals out," but it is more difficult to get rid of a corrupt or incompetent autocrat.

Modern democracy is not the rule of the people as a whole, of ignorant masses, of "the blind God of Numbers." A democracy no less than an autocracy is a government by leaders, but in the former case these leaders are chosen by the people and are responsible to them and in the latter they are not. Leaders in a democracy have great power, and in great crises such as war, their powers may be temporarily greatly increased, but they are not autocrats for they must render to the people an account of their stewardship. In no modern form of government do the people as a whole make plans for war or peace, for taxation or legislation or even party platforms. These things are determined by leaders and in general the mass of the people hold them responsible only for results. Government, no less than personal behavior proceeds by the principle of "trial and error," and the majority in a democracy decides only whether the results are failures or successes. Furthermore a democracy is much more sensitive to this test than is any other form of government, for a failure is quickly abandoned and its authors repudiated. The contrast between democracy and autocracy is not between "numbers and rightness," but it is between rightness as measured by the effect upon the majority or on only a small minority of the people. Modern democracy demands, and has, experts even in matters of government, and who can truly say that the results are on the whole worse than in an autocracy?

The greatest problem which confronts all types of government is the problem of social coöperation. Efficient coöperation may for a time be forced upon a people by a powerful autocracy but history has generally shown that such a course ends in class antagonisms and the destruction of social union. Self-government and majority rule are generally recognized as the best form of government for intelligent people; a paternal form of government may be better suited to ignorant and undeveloped races, but only in case willing coöperation can be secured, for the end and aim of social evolution is coöperation without compulsion. A genuine democracy seeks and obtains a degree of coöperation which compulsion can never obtain. Ideal democracy means not less specialization but fuller coöperation than in other forms of government.

II

But it is not so much Mr. Ireland's views on democracy as on heredity to which attention should be called in this Journal. There is good evidence, as Mr. Ireland assumes, that acquired characteristics are not heritable and that mental and moral traits are inherited in the same way that physical traits are—namely according to the law of Mendel. Sexually produced organisms are mosaics of characters each of which is usually derived from one or the other of the two parents but not from both. These characters, or rather their germinal causes, the genes, are separable in hereditary transmission and in the formation of the germ cells they are taken apart and in the fertilization of the egg new combinations are made. Good and bad traits are widely distributed throughout all classes of men, good and bad genes occur in all kinds of germplasm. East calculates that the gene or genes for feeble-mindedness occur in one person out of fourteen in the population of this country and undoubtedly the genes for superior intellect are also widely distributed. Even in obscure families a fortunate combina-

tion of good hereditary factors may give rise to great leaders, and in the most distinguished families an unfortunate combination of bad genes may lead to nonentities or worse. In short there is the sharpest distinction between the popular idea of heredity as expressed in the "law of entail" and the law of Mendel. Property, titles and privileges may be entailed but not personality, character or ability. No doubt the chances that good or bad traits may appear in offspring are much greater in certain families than in others, for while both good and bad traits are widely distributed they are not equally distributed. Nevertheless the actual facts show that great leaders do come from the lower levels of society as well as from the higher. Some of the greatest of the sons of men have had the most lowly origin. No one can predict today from what social level the great leaders of tomorrow will come. Many of the leaders in the present world crisis are men of humble birth, many who had the most distinguished lineage have been most dismal failures. Bateson somewhere comments on the great advantage it would be if only men could be propagated asexually as many cultivated plants are, for then it would be possible to entail character and ability.

Education or any other environmental factor can serve only to bring to development potentialities which are present in heredity, but, on the other hand, these potentialities would never become actualities except for the influence of education and environment. In every person many potentialities, some of them perhaps of the greatest value to society, remain relatively undeveloped, and this is especially true where popular education is lacking or in a society with fixed class distinctions.

Mr. Ireland asserts further "that assortative mating operates unremittingly to depress one end of the moral and intellectual scale and to elevate the other," that there is a "constantly widening gulf which separates mediocrity from talent, and the lapse of time is making talented families more talented and forcing others further and further below the line of mediocrity." If this is really true it should be easy to demonstrate, but I am not aware that any historical evidence has been or can be furnished for such a conclusion. No doubt if assortative mating among men could be directed and controlled as in the case of domestic animals such results as Mr. Ireland describes could be secured and indeed all except the most talented types might be eliminated, but as yet these are only theoretical possibilities so far as mankind is concerned. There is relatively little assortative mating of such a kind as would be necessary to bring about these results, and even where selection is most carefully made it is not continued for many generations along the same lines. When one considers the tendencies among the peoples of the earth as a whole, as over against these theoretically possible results of assortative mating, there is seen to be a great movement against fixed hereditary classes, even against national and racial segregation. Mating is determined by propinquity rather than by hereditary likeness, and such a method can never lead to hereditary uniformity.

In conclusion there seems to be no reason to conclude that heredity and democracy are incompatible. The law of entail is aristocratic but the law of Mendel is democratic. Democracy has never meant that all men are equal in intellect or character. It is not a denial of personal inequalities but is the only genuine recognition of them; on the other hand class or family distinctions disregard personal distinctions. No social system can afford to disregard the great personages who come of humble families or to exalt nonenities to leadership because they come of great families.

It is the creed of democracy that leadership should depend upon individual worth and distinction and not upon the greatness of some ancestor whose good qualities may have passed to some collateral line—but this is not the faith or practice of aristocracy. After

all the merits of any system of government should be measured by its actual results on society as a whole, over long periods of time, and measured in this way democracy has no cause as yet to be fearful of the results.

---

# DISCUSSION OF ARTICLE ON DEMOCRACY AND HEREDITY

Madison Grant

---

THE JOURNAL OF HEREDITY for December, 1918, published a short article entitled "Democracy and the Accepted Facts of Heredity," by Alleyne Ireland.

The subject is of peculiar interest at the present crisis, and amid the popular clamor about socialistic democracy as a panacea for all social and political ills, it is refreshing to find an author who has the courage to stand firmly on historic facts and the lessons to be derived therefrom and to challenge the verdict of the masses.

In 1910 Èmile Faguet wrote the "Le Culte de l'Incompétence" and showed how banal, inefficient and tawdry the government of France had become in the opening decade of the twentieth century, but since then few voices have been raised to protest against the theory of government which entrusts the conduct of public affairs to the most incompetent members of the community.

The world war has had the effect of a rigid readjustment and of bringing the strong men to the front, especially in France, and in America also where the great heart of the people more than compensated for the mediocrity of the government. In military affairs this process of sifting proceeded rapidly, and it is probable that in Europe the administration of the armies was finally vested in those entirely efficient. The war did not last long enough, however, for America to replace the politicians by men of demonstrated ability at home.

In every branch of human activity, except government, we demand a certain amount of expert or technical knowledge, but apparently anybody is good enough to represent the public in a board of aldermen, a state assembly or even in the Federal Congress. There is no attempt made to require experience, knowledge or even a very high degree of personal character—and, least of all, does it seem to be of great importance, even for those who fill the highest positions in the nation, to possess long traditions of Americanism, without which no man can adequately represent the Republic.

Almost the only exception to the foregoing was the circumstance noted last autumn in Chicago that those candidates for various municipal offices who bore nondescript foreign names were one and all anxious to state that they were "born in America."

It is pathetic to note that in our American democracy the electorate having once accepted the theory that any man is qualified for any office without "distinction of race, creed or color," we proceed to limit and check the power of our chosen representatives by all manner of regulations, statutes and constitutions. This is in sharp contrast to England, which, being without a written constitution, has from time out of mind entrusted political power only to those classes which were deeply imbued with the unwritten traditions of the nation. If England ever falls into the hands of the Socialist Labor party it will suffer greatly from the lack of a written constitution because their new rulers will be devoid of respect for those great precedents of human justice and freedom

which have created and maintained the British Empire.

Alleyne Ireland's paper on democracy is a straight challenge to the relative value of heredity and environment. The extreme democratic, and still more the socialist, theory of government necessarily rests on the assumption that whatever inequalities exist between men or races are due to an unfavorable environment, and that, given an equal environment, which today spells education, the result will be the speedy obliteration of the differences between man and man and make them all equal in body, character and intellect.

This must be a very popular viewpoint, and this theory does commend itself most strongly to the lowest classes in every community, and in America it appeals to those races who, repudiated at home, have found here an hospital refuge. These classes and elements are noisy out of proportion to their number and are totally devoid of the American traditions of the past three centuries. To these classes and to these races, which have been previously denied, perhaps on the merits, access to social circles and to positions of responsibility, the breaking down of all barriers is most welcome.

This is Internationalism—a creed which finds ready acceptance among those individuals who, having neither flag, nor country, nor antecedents, nor traditions, nor language, nor even surnames of their own, are naturally desirous of abolishing these attributes or "privileges" in others. These men deny all discussion of race and raise the cry of "race prejudice" the moment the subject is opened.

Race, of course, is the greatest of all privileges and is the one thing that cannot be abolished by any human device except the actual killing of its possessor. In the last analysis the Bolshevist movement in Russia is a war of races. The Alpine peasantry, under Semitic leadership, are engaged in destroying the Nordic bourgeoisie, and with it the only racial elements of value in that great sodden welter of quasi-European peoples called "The Russias."

This objection to the discussion of race values, as I am informed, was largely responsible for the failure in France to take anthropological measurements during the war. In this country Mr. Ireland's paper will meet with violent protest from those races who feel themselves aggrieved by any classification or distinction among mankind based upon race.

If more Americans would come forward and say in print that which is universally stated and admitted in private conversation concerning the military, social and political value of the different immigrant races which have of recent years flooded our country, there would be a far more healthy reaction to the problems involved and less would be heard about a universal democracy bringing in the millennium.

In America the melting pot is an absolute failure. Immigrant races retain just what they brought with them, and some are good and some are bad. This is well-nigh universally admitted in private, but in public it is most unpopular to hesitate to bend the knee in servile adulation to the great god, Demos.

Our vaunted freedom of speech and of press in America probably is less observed than anywhere else among civilized men. If any reader doubts this statement let him try to obtain space in the public press for strictures on certain races and on certain religions; to make comments on their doubtful loyalty during the war; to mention their bias in favor of Old World antipathies; to discuss or disclose the shifty measures used to avoid the draft by some of these aliens; to point out the religious forces that lay behind the refusal of Australia or of Ireland to accept the draft and bear their share in the great world war, or to indicate the source of the opposition to the draft in French Canada. After such an attempt he will be quickly relieved of the idea that this is a free country.

It is, therefore, an act of no small courage on the part of Mr. Ireland to come forward and register a protest against the fatuous folly of the universal extension of the theory that all human ills can be cured by democracy and then "more democracy."

# ARISTOCRACY AND POLITICS

## Further Discussion of Mr. Alleyne Ireland's Article

PRESCOTT F. HALL

MR. ALLEYNE IRELAND'S article "A Biological View of Politics," in the December number of the JOURNAL, states a view with which many serious students are in sympathy, but which few have the courage to state. I say "courage" because the opposite view is so universal in popular discussion that it seems to be crying in the wilderness to preach against it.

The widespread and fatuous belief in universal suffrage and in what Goncourt called the "barbarism of number" is largely due, I think, to the increasing prevalence of a new psychological type. For lack of a better term I have coined the word "expansile" to designate it. Just as we have "motiles," "audiles" and "visuels," depending upon which sense is most active, so we have "expansiles," whose characteristic is that they are the victims of any idea which is broader or more inclusive quantitatively than some other. What bodily variation is correlated with this is not clear; but it may be a symbol, in the psycho-analytic sense, of claustrophobia, and may signify a reaction from the increasing urban life. The expansile tendency is especially marked in the desire for "equality" of any kind, this being a species of inclusiveness. In fact, in some persons, the lust for equality becomes a form of paranoia. Thus, if the discussion is of suffrage, everyone should have a vote; if of wages, everyone should have an equal wage; if of education, everyone should have an equal opportunity. The idea of proportional opportunity, by which those most gifted should have the best chance, is obnoxious to the expansile. The kind of thing often expressed in the phrase "brotherhood of man" implies the maximum of expansion and equality; although logically altruism is perfectly consistent with inequality.

The most disastrous example of false reasoning under the influence of the expansile tendency was provided by the French Revolution. It is well known that certain Masonic societies had a good deal to do with this event, notably the *Grand Orient* of France, and the *Philalthètes* of Paris organized by Cagliostro. The false reasoning consisted in assuming that certain principles of equality, which had worked very well among the picked and chosen members of the lodges, could be extended at a stroke to the whole population of France. The writers of our Declaration of Independence and Constitution, being Masons, adopted the language of these principles when this country started on its separate existence. Fortunately, the population of the United States at that time consisted of picked specimens of the Nordic race, selected by the perils of voyaging hither and of exploiting a new country. These people had sense enough to entrust the management of their affairs to the most capable among them; so that, for some sixty or seventy years the government, although democratic in form, was aristocratic in fact. At the present time this is no longer true. Respect for intelligence and ability have so far disappeared that it is almost impossible for a strong and able man of independent views to be elected to high office. To get into office, a man must now play the demagogue.

The result is a lowering both of ideals and of execution. The popular opinion of the masses must be consulted at every step. Amiel says: "The stupidity of the Demos is equalled only by its presumption. It is an adolescent who has power but cannot attain reason . . . Democracy rests on the legal fiction that the majority has not only power but reason, that it possesses wisdom as well as legal rights . . . The masses will always be below the average, . . . and

democracy will end up in the absurdity of leaving the decision of the most important questions to those most incapable. This is the penalty for its abstract principle of equality . . . which ignores the inequality of valor, or merit, of experience, in other words, of individual effort."

Many champions of the view that intelligence and ability should have no more than their numerical proportion of power in government, in other words, those who believe in government by "counting noses," admit more or less of Amiel's indictment. But they contend that, although democracy in Plato's words is the best form of bad government, it is essential to the education of the people. These persons forget that psychology has shown that the larger part of education consists in imitation and emulation. If the thing before the eyes of the next generation is bad, that is the thing it will imitate and emulate. When a jailbird is elected to high public office, what is the influence on the young politicians and voters? For, as Mr. Ireland points out, if education is not transmitted by heredity; if only the psychic environment is handed on in the form of institutions, books and records, the process of information has to be done over in every generation, and if at any time the institutions have changed for the worse, the educational facilities are lowered also.

The more intelligent a community, the more it tends to recognize and venerate ability and merit. In an intelligent electorate, the *aristoi* always have more than their numerical quantum of power, even under democratic forms. Hence there democracy works relatively well. But elsewhere, and especially under all forms of "pure democracy," this is not so. The matter is further complicated by the demand for socialism. As Èmile Faguet points out, democracy, having for its principle equality of political rights, is the greatest breeder of aristocrats; for there is complete freedom and inequality as regards natural conditions. As soon as this is perceived, socialism demands equality also in these natural conditions; hence socialism is as directly opposed to democracy as aristocracy is, but with the difference that it seeks to level everything instead of favoring the best.

Mr. Ireland seems to me entirely right in holding with Nietzsche, Schopenhauer, Renan, James and many historians, that great men lead their age, instead of being the result of their environment; and no doubt he would agree that progress is to be measured by the achievements of the greatest rather than by the condition of the average. As a matter of fact, as Lecky and Mallock have shown, pure democracy is an impossibility, except in a relatively small area where the people are intelligent and homogeneous in character if not in race. Elsewhere, it is simply a question of what kind of oligarchy shall govern; for there will be an oligarchy either of aristocrats or of demagogues and bosses. By aristocrats I mean those of special intelligence and ability. These qualities, as Mr. Ireland shows, are in general hereditary; and in the early days when the Nordic race overran Europe, it rightfully became the aristocracy of Europe by virtue of the possession of these qualities. At a later period, for various reasons, the identity of privilege and ability no longer held good in many cases; so that I am not now contending for special power based solely on ancestry.

But even where the better sort of men have the leadership, they are often subject to the temptation to weaken it for the benefit of a temporary advantage. Nearly every extension of the suffrage has been the result of a bargain in which some party in power has traded the public good for the adherence of some faction hitherto denied the ballot, and usually in the name of progress and reform. Ludovici has pointed out the deterioration in the British House of Lords through the successive creations of life peers, mostly made to tide over some political crisis; and that the addition of men unused to legislation, even though able in other lines, weakened the average capacity of the House. The same thing can be said of the broadening of the electorate itself. And yet the recent abolition of plural voting in Belgium has been hailed as a step on the

road to the New Jerusalem! In this country, so far as I am aware, there have been only three cases where the suffrage has been changed from a broader to a narrower basis. In early Massachusetts, it was limited by a vote of all the colonists to church members and property owners; in New Jersey, woman suffrage was abolished early in the nineteenth century; and in Rhode Island, the property-owning qualification of $75 was recently raised to $300.

In my opinion, we never shall have good government until the suffrage is limited to those having a certain education, or paying a certain tax; perhaps also allowing those to vote who are willing to pay a fee for the privilege. We never shall have good financial management in cities where, as in Boston, 118,000 non-taxpayers spend the money of 18,000 tax-payers. For, taking things on the average, as we always have to do in sociological questions, the liability to a tax implies a certain measure of success and ability. That is why the Bolshevist, who is a mentally and nervously irritable person, filled with hate in the form of envy, is so against property as an institution.

Limitation of the suffrage may seem impossible of accomplishment in these times, when we are seeking the smallest possible political unit, even as we try to split up the atoms of physical matter; and yet, if everyone would speak out who desires it, the achievement might not be so remote. Perhaps the most pregnant saying of Goethe, which embodied a generalization from his wide study of biology and other sciences, was that anything to succeed must have "Beschraenkung"—limitation. Goethe was not what I have called an expansile. He would doubtless have recognized that the chief danger of the American people today is the tendency to follow out logically abstract ideals without reference to the concrete situation. This, as LeBon has shown, is a tendency indigenous to the Latin but not to the Nordic spirit. We are developing it partly through the dilution of our national character by immigration, and partly by hearkening to the catchwords of expansile leaders and those who wallow in humanitarian platitudes.

Therefore we should all be grateful to Mr. Ireland for stating the case so clearly, and for his testimony to the value of aristocracy, based on his long and thorough study of various experiments in government.

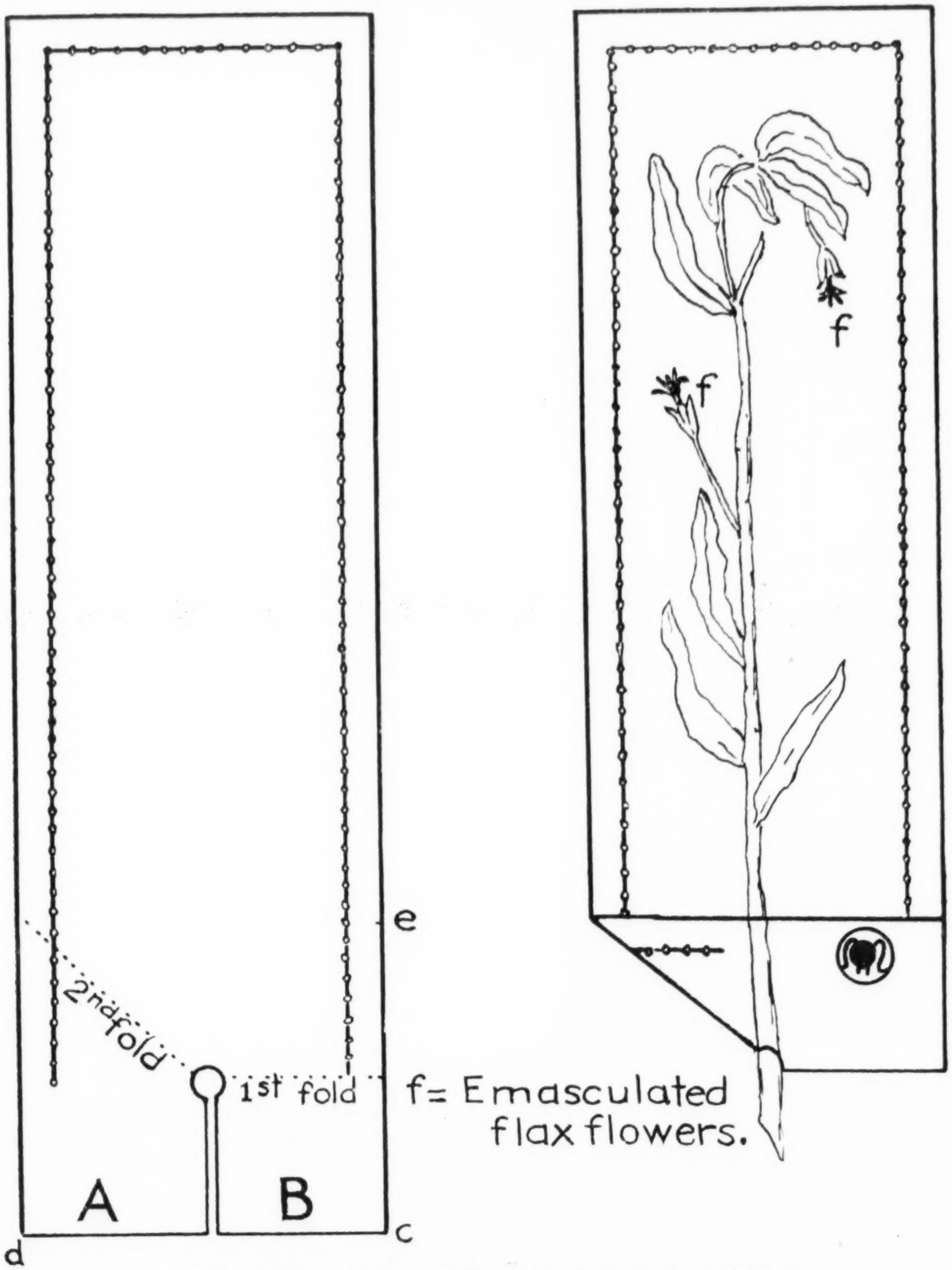
## Plant Breeder's Envelope

The plant breeder's envelope, described in the following paragraph, worked admirably on tender succulent flax plants and ought to be of use for other delicate plants. It has the advantages of being light in weight, insect proof, moisture proof, and of being readily adapted and used. (Fig. 6.)

A piece of oiled paper is folded or doubled the desired width, with an additional inch or two which is to be left unstitched to facilitate opening the envelope. A sewing machine is used to stitch off as many envelopes as the length of the folded sheet will permit. The envelopes are cut apart with scissors and slit up through the middle of the unstitched portion at the base. At the crotch of this slit a hole is cut of sufficient size for the plant stem to fit snugly when enclosed. One half, section B, of the unstitched portion is folded lengthwise towards the top of the envelope. The other half, section A, is folded on a forty-five degree slant over the first half. Points c, d, and e coincide, and at this corner where the folded parts overlap a snap fastener such as is used on women's dresses is used to fasten the envelope base together. The plant breeder's envelope is now in the same position as when enclosing an emasculated flower on the stem of a plant. The unstitched portion at the envelope base must be one-half, or less than one-half, the width of the envelope in length so that, when folded, there will be no unstitched portion above the fold.

Robert L. Davis,
*Scientific Assistant, Fiber Investigations, U. S. Department of Agriculture, Washington, D. C.*

# PLANT BREEDER'S ENVELOPE




**A PRACTICAL ENVELOPE FOR PLANT BREEDERS**

It has the advantage of being light in weight, insect proof, moisture proof, and of being readily adapted and used. See description on opposite page. (Fig. 6.)

# A FOSSIL EAR OF MAIZE

## First Tangible Evidence of the Existence of Indian Corn in Geologic Times

G. N. COLLINS

*Bureau of Plant Industry, United States Department of Agriculture, Washington, D. C.*

DR. F. H. KNOWLTON has recently published the description of a fossil ear of maize from Peru.[1] The specimen, which is described as a new species, *Zea antiqua* Knowlton, was purchased from a collector of curios in Cuzco, Peru, in 1914. In spite of its unsatisfactory history, the specimen is of especial interest since it affords the first tangible evidence of the geological existence of this important cultivated plant.

It is well known that maize or Indian corn was grown widely in North and South America before the time of Columbus. How long before, there is as yet no way of determining. A very long period is indicated by the fact that the progress made in the improvement of this plant since the discovery of America is insignificant in comparison with the changes that must have taken place since the prototypes of maize were able to exist as wild plants. Not only were the kinds found growing by the earliest explorers similar to those now cultivated, but remains of ears found in prehistoric graves are almost duplicates of the varieties grown in the same regions today.

The finding of a fossil ear means that the origin of maize may now be transferred from prehistoric to geologic times, for Dr. Knowlton is confident that, although the specimen may not be assigned to its exact geological period, it is an undoubted fossil. Yet the type it represents is domesticated maize essentially like the varieties still being grown in Peru and Bolivia.

Mexico is generally thought to be the region where maize was originally domesticated. The chief reason for assigning the origin of maize to Mexico rather than to South America is the important fact that Mexico is the natural habitat of teosinte, the nearest wild relative of maize. On the other hand, the great diversity of types existing in South America certainly bespeaks either a very great antiquity or a multiple origin.

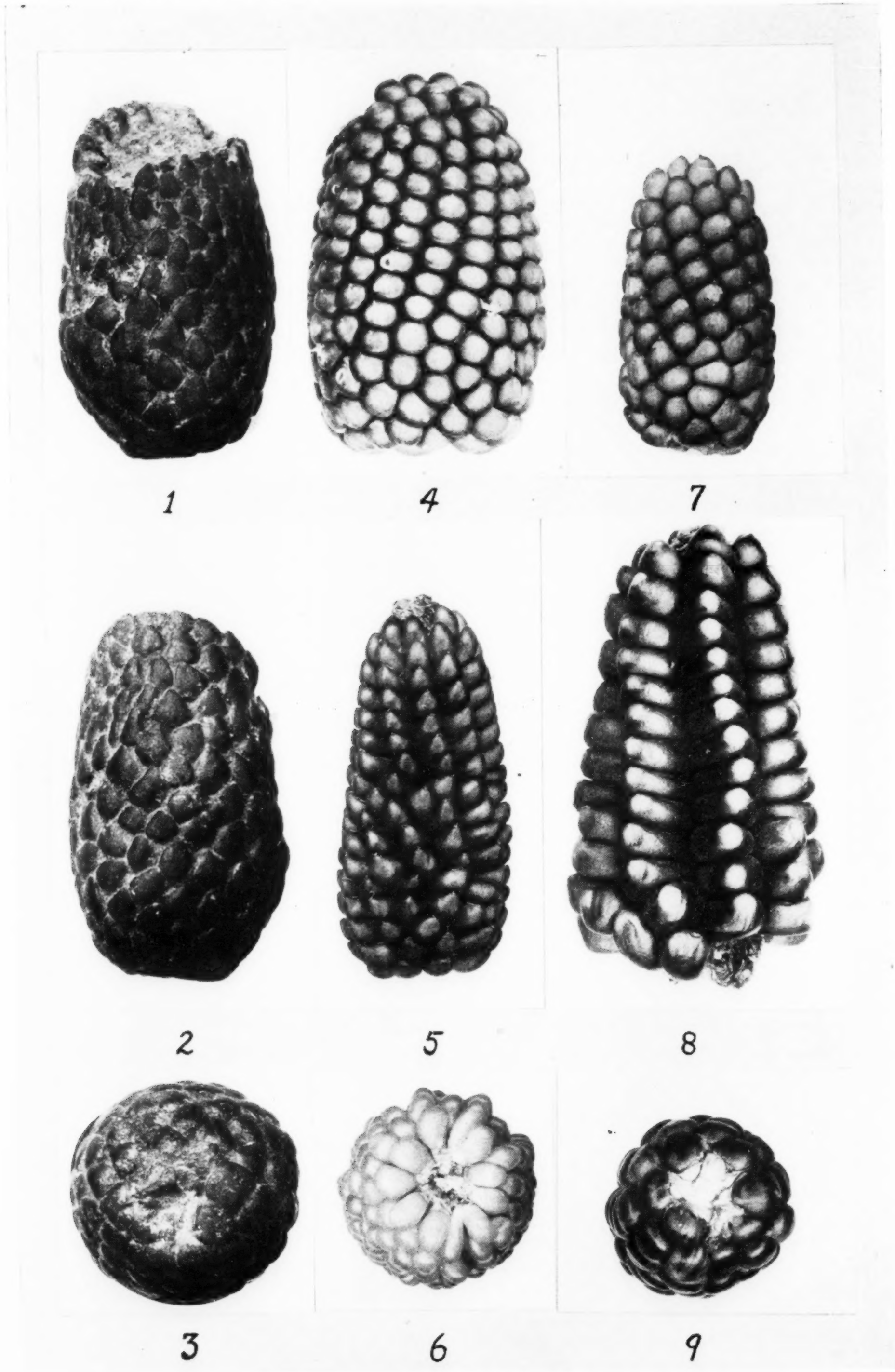
Prior to the discovery of *Zea antiqua* the most ancient evidence of maize was the specimens found by Darwin[2] who unearthed "heads of Indian corn," mixed with marine shells and earth on an elevated ledge on the island of San Lorenzo near Callao, Peru. The ledge on which the relics of maize were found was elevated 85 feet above sea level. The shells which accompanied the maize specimens belonged to recent species and were covered with a few inches of detritus. Darwin states that the maize and human remains "had all indisputably been embedded with the shells."

The ear of *Zea antiqua* is 60 mm. long and 35 mm. in greatest diameter. The apical portion is missing but the original ear must have been about 80 mm. in length. The butt is rounded and the ear is strongly tapered, there being no portion even approximately cylindrical.

The seeds are from 4 to 8 mm. in length and from 3 to 5 mm. in width, sharply pointed and irregularly disposed. The seeds on one side of the ear at some distance from the base are somewhat smaller and more irregular in form, making the ear slightly asymmet-

[1] Jour. Wash. Acad. of Sci., Vol. 9, No. 5, pp. 134-136, March 4, 1919.

[2] Darwin, C. R., "Geological Observations on Coral Reefs, Volcanic Islands and on South America," Pt. II, pp. 47-49, London, 1851.




**FOSSIL MAIZE AND MODERN MAIZE**

An ear of fossil maize (*Zea antiqua*) compared with existing South American types. Nos. 1, 2 and 3, different aspects of the fossil ear; No. 4, a Bolivian variety from high altitudes; Nos. 5 and 6, a Peruvian popcorn from Ollantaytambo; Nos. 7 and 9, Copacabana variety from near Lake Titicaca; No. 8, a Peruvian variety called Granada. (Fig. 7.)

rical. Asymmetry of this kind is frequently observed in varieties which have the ears closely oppressed to the culm. If this analogy is correct, the aspect shown in Fig. 7, No. 1, is the axial side of the ear. The articulation of the seeds with the cob can be readily made out and individual seeds are easily detached. The structure of the cob is not apparent, at least without sectioning. The seeds extend around the base indicating that the pedicel must have been very small. In size and shape the specimen is similar to the ears of Peruvian and Bolivian varieties, illustrations of which are shown with those of the fossil ear in Fig. 7.

The gradually rounded butt is not an uncommon character and is well illustrated in Nos. 4, 5 and 7. The shape of the seeds cannot be exactly duplicated by any specimen in our collection, but is not unlike those of a Peruvian variety of pop-corn shown as No. 5 that was grown near Ollantaytambo. Pointed seeds are a common characteristic of Bolivian and Peruvian varieties, but they are usually much larger than those of *Zea antiqua*. An example of these larger pointed seeds is shown as No. 8. The irregular arrangement of the rows is approximated by specimens of the Copacabana variety from the region of Lake Titicaca, No. 7.

The extent to which the base is covered by the seeds seems almost to preclude the possibility of a pedicel able to hold the ear in an upright position. Equally small pedicels are, however, not uncommon in Peruvian specimens. See Nos. 6 and 9. In existing varieties having very small pedicels, the pedicels are also short and the ear is supported chiefly by the subtending leaf-sheath.

While the fossil ear is not duplicated by any ear in our collection, it presents no new characters, but rather a different combination of characters found among the existing types.

---

## Differentiation of Bright, Medium, and Dull Pupils

Anyone who visits a typical public school in which the pupils of each grade number thirty or more can scarcely avoid noting marked differences between pupils in a single grade in the facility with which they assimilate knowledge of the subjects being taught.

It is becoming a well-recognized fact that a pupil who falls in the first group in one subject tends to fall in the same group in all subjects, and that the same is true of pupils falling in the second or third groups. There may be, here and there, marked exceptions to this rule, but it is true in general. One is naturally led to the conclusion, therefore, that the pupils of the second type mentioned simply lack the general mental capacity to assimilate knowledge as rapidly as the other pupils, though their having passed the grade below would seem to indicate that if given sufficient time they could understand the subjects under discussion, at least fairly well. One is led to conclude also that the pupils of the third type mentioned possess a degree of native mental ability which enables them to acquire knowledge more rapidly than do their fellows.

The almost inevitable outcome of such maladjustment is the premature quitting of school and the consequent misfortune of a half-finished education accompanied by a feeling of malevolence toward the school and society.

Perhaps the chief purpose of intelligence measurement, then, is the scientific (as well as rapid and accurate) classification of pupils in regard to their native capacities to learn, in order to provide for the separate teaching of pupils of marked differences in ability to progress in school.—*From the Preface of a Manual of Directions for Administering the Otis Group Intelligence Scale, World Book Company, Yonkers-on-Hudson, N. Y.*

# THE FIGHTING ABILITY OF DIFFERENT RACES

**(Second Letter)**[1]

---

FRANCE, *December* 6, 1918.

AS I'VE told you before, the Normans and North French finally made up the fighting troops of France that could be depended upon in disaster as well as victory, the infantry that held and went forward. The Bretons, too, were tough and steadfast fighters but seemed to lack something of the madness of the Normans and North French on occasions for a grand gesture.

On the front the number of big, burly, blond Frenchmen amongst the officers seemed to me striking, while blue eyes were almost in the majority—more than one of our officers and men have remarked in my presence on this fact and on the stature and blondness of the French officers and fighting men. It was so contrary to their preconceived notions.

Of course you know the British and their qualities too well for me to have to record them. The Scotch most of all were the natural fighting men of the war—the ones who actually took joy in it more than any of the rest. The love of fighting was a great source of weakness to the British more than once, as it was more than once with us, too, The Scotchman seems to be a sort of drunken madman in a fight. Fear of death does not appear to bother him in the least. And the few Scotchmen in our regiment were the best and most reliable noncoms we had. McKinzie and Knox, two noncoms of my old battery, particularly distinguished themselves in trying situations, acting with coolness and courage that were highly commendable.

Amongst our own highly heterogeneous troops the fighting ability of an organization usually could be measured by its percentage of Americans of the old stock. And as outfits were filled up by draft "replacements" the fighting ability perceptibly waned. This is stated by the officers who commanded the platoons and companies and battalions in the fighting. Of course the entire army was officered by Americans of the old stocks almost 100%. The exceptions are quite negligible. The Irish are awfully good fighting leaders. But the number of Irish names is not conspicuously large.

I am quite sure the New England troops were our best—the northern troops infinitely superior to the southern in "guts," discipline and fighting ability—though the southern officers were conspicuously brave and able all around with a fine faculty for true leadership.

The 77th Division seems to have been a curious contradiction since it was made up of the scum of New York City, all drafted and of all races, Jews, Italians, Poles, and Russians. And it was really a wonderful fighting outfit. It was officered by American gentlemen, however, and their leadership was equal to anything shown in the war. The things they did with their city scum were really heroic, again and again, and equalled any of the mad, forlorn hopes that the mad Highlanders or the stubborn English ever pulled. The Jews seem to have displayed lots of "guts" too (when they were in fighting units), but they were wonders in getting into the safer branches of the service.

The Mediterranean peoples seem to have been least able to stand shell fire, gas and the general hell of the game. It is more than a coincidence that officer after officer has told me of

---

[1]Received from Madison Grant. Written by an American Army Officer. For the first letter and accompanying discussion see JOURNAL OF HEREDITY for January, 1919.

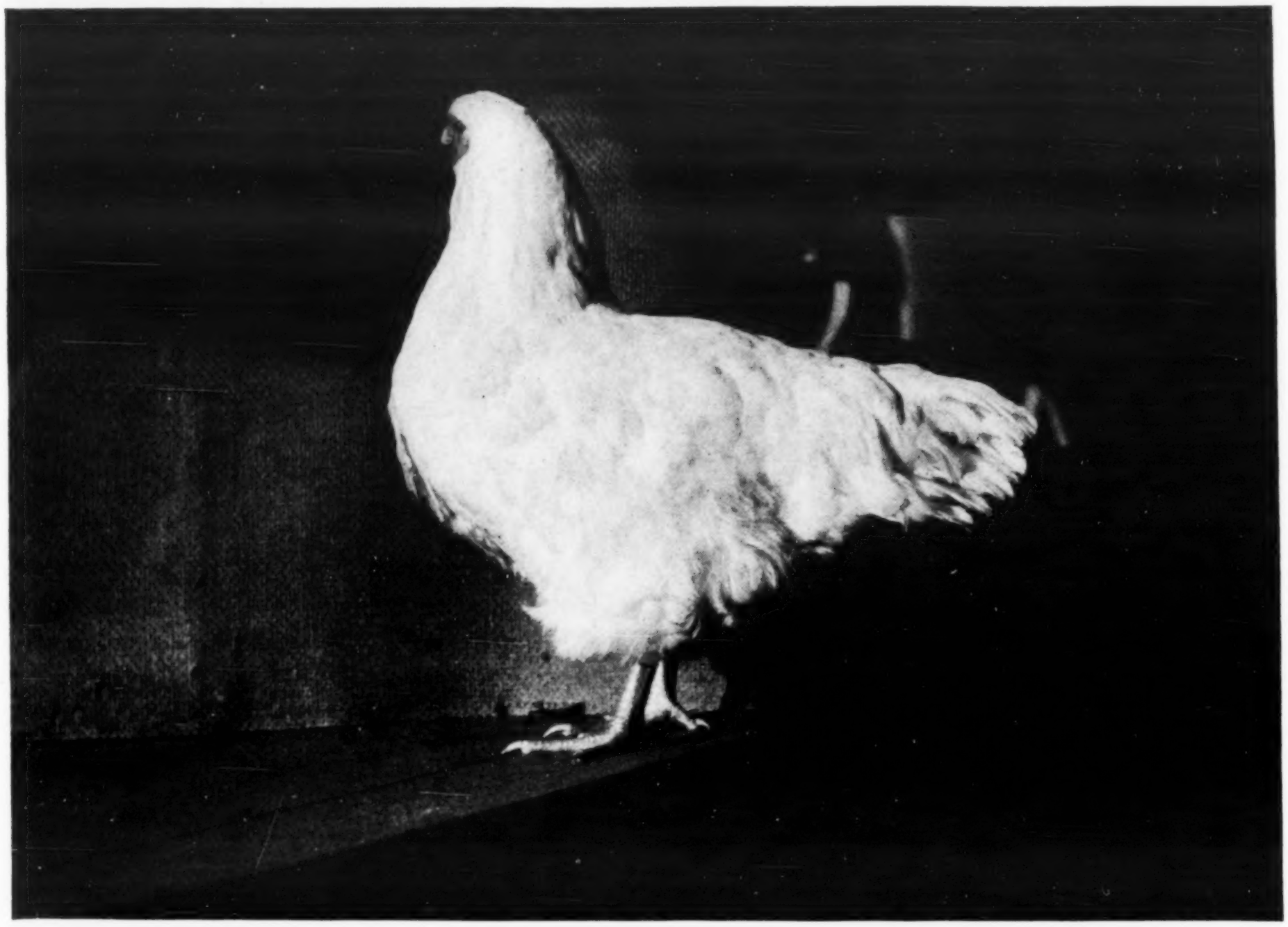
Italians, privates and noncoms, who broke, quit cold and lay down like curs all of a sudden after fighting with dash and courage up to a certain point. They lack the character to "carry on" to the finish. You cannot rely on them at all. The Slav is a mirror—he is what his officers and comrades are. But he is poor stuff—a childish-minded, unstable, moody animal, and seldom over-burdened with loyalty and reliability. It's a shame to think the clean blood of the old American stock is going to continue to be contaminated and debased by these things from south and eastern Europe. Is there no way to stop it? Again and again I've heard officers here say, "There's just one fighting man in our army—the American!" And when he said "American" he excluded all Wops, Polocks, Slavs, Turks and Asiatics, and we all knew what was meant.

The negro failed utterly under his own color, but officered by white men he was pretty good! Indeed the negro officer is perhaps the most pitiful thing in the whole war. He failed through no fault of his own—but his color. The negro soldier had no respect and no confidence in his black officer. No matter how good the black officer is, he is first and always a nigger in the eyes of other negroes. And leadership is surely based on nothing but confidence, —bluff, if you choose to call it so. And no negro can bluff another negro.

The Indians I've heard of and seen (only a few) have all been good, nervy men and very good soldiers, natural soldiers in every way. And they seem to take naturally to war, shellfire, gas and all. I've heard nothing but good words for them from officers who commanded them and whom they fought under.

But no fighting man in the war was the superior to the real, tall, lean, blue-eyed, tow-headed *American* doughboy—our American, I mean. A red-headed second lieutenant told me of a party he pulled with a bunch of real Americans who had been without food for thirty hours and for half a day without water. The Boches pulled a counter attack on them at dusk after harassing them all day with shells and grenades. He said he told his men to "go out and meet them" and not to retire until they heard his whistle blow. He said his men went out at 'em with howls like madmen before he'd given the word. He said the crash of the meeting of the two bodies of troops was really tremendous and that he could not bring his men back from the pursuit till they had driven the Boches a kilometer northward. Several men he had to threaten with his revolver to force them to retire. "Just let me get *one* more, Lieutenant, just *one* more, Sir! Please!" they'd beg him. And the bayonet and butt was the order of the fight on our side all through. It's so typical of the stories the doughboy officers tell that it must be our fighting way, the national method of getting at 'em.

The devil of it is that the Americans got bumped off too fast—and the replacements were too often "not there." In the papers the "draft army" is O. K., but we know about it. You had the right dope in the Great Race. It is the great race and no mistake.



**WINGLESS WYANDOTTE, MOTHER OF NORMAL CHICKS**

Photograph showing a sudden mutation which may be recessive, as this hen, when mated to a normal male, has produced only normal offspring. It is possible that the mutation may be of embryonic origin and not carried in the germ-plasm. (Fig. 8.)

## A Wingless Wyandotte

The pullet shown in the illustration (Fig.8) was hatched in April, 1918, from a flock of normally formed White Wyandottes. The male of the flock was not related to the females. The pullet was born without wings or any sign of same. At the spot where the wing should join the body on either side of the bird, there is what might be called a "cow-lick" of feathers. This chick was the only abnormal one of those hatched from the flock with the exception of a cockerel which was born without a tail, having no "parson's nose." The pullet weighs 5½ pounds, and has been laying steadily since December 1. She has been mated to a normal unrelated cockerel of the same breed. Up to the present all her chicks have been normal. Since January 1, the pullet has started to leap and can now easily leap to its roost, 2½ feet from the ground.—J. R. TERRY, *Department of Agriculture, Victoria, B. C., Canada.*

---

## Develops New Hybrid Cowpeas

In its plant-breeding work with cowpeas, which involves several hundred hybrids and selections, the United States Department of Agriculture during the past year has developed several new sorts. These varieties are Potomac, Arlington, Columbia, White Hybrid, and Early Buff. Extensive field work is being conducted by the department with hybrids, especially in the wilt and nematode lands of the Southern States. Two hybrid selections, unnamed as yet, have been found highly resistant to both nematodes and wilt and are superior to other sorts for the production of seed and forage. These two selections are being grown in quantity for more extensive field tests next year.—*Weekly News Letter, United States Department of Agriculture.*

# DOMESTICATION OF ANIMALS IN PERU

O. F. Cook

*Bionomist in Charge of Crop Acclimatization, Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C.*

SEVERAL misapprehensions appear in an article published in *Science* for March 15, 1918, p. 268, under the title "The Domestication of the Llama." Reference is made to an argument that "thousands of years must have gone by before the llama and its kindred, the alpaca, the vicuña, and the huanacu, could have been brought to their present state of domestication." Instead of four kindred species having been brought into domestication, there seems to have been only one. The vicuña and the huanacu are not domesticated animals, only the llama and the alpaca, and both of these are supposed to have been derived from the huanacu. Certainly they are not more different than some of the varieties of other domesticated species. Though distinct breeds are not separated, there is much diversity in size, form and color, as well as in the length and texture of the wool in the llama, as well as in the alpaca. If a common origin from the huanacu be denied, it is necessary to assume the former existence of another wild species, the vicuña being too different to figure in such a calculation.

Both of the wild types, the huanacu and the vicuña, are extremely shy, retiring and fleet, like deer or antelope. If caught young and raised in cages, they may become tame, as do most kinds of deer and antelope, but even the domesticated llama is hardly "a docile animal by nature." It is a stupid, unwilling and resentful beast, in some respects like the camel, in others like a sheep. It shares the camel's habit of blowing its nose when offended, but is too small to ride and lacks the physical endurance of the "ship of the desert." Alpacas are somewhat smaller than llamas, are seldom trained to carry burdens, and are herded with the female llamas on the grazing lands of the high plataus. Of the alpaca it is said that an individual animal cannot be driven away from the herd, but the llama is also strongly flock-minded.

If animals that "feed themselves" and "do without shelter" are only "partially domesticated," not only the llama, the camel and the reindeer, but the sheep, cattle and horses of many countries would fall into this category. With even a little freedom most of our domesticated animals will seclude themselves from mankind or revert to hostile instincts at the breeding season, and hostile propensities are also shown habitually by some individuals of our most domesticated species, dogs, cats, pigs, sheep, cattle and horses.

One of the most completely domesticated creatures is the *cuy*, or guinea-pig, also a native of Peru. This animal meets all the "criteria of domestication" in which the llama is said to fall short. The cuys are sheltered, fed and bred in the houses of the Indians, show no hostility or fear, and refuse even to crawl over a threshold raised a few inches above the ground. Yet the wild cuys are extremely shy, and this ancestral trait persists in hybrids, even when the proportion of wild blood is very small.

A general result or consequence of domestication in mammals is the breaking up of the specialized and finely-graded distribution of the hair colors

**YOUNG ALPACAS AND LLAMAS**

A flock of young alpacas and llamas, mostly uniform or self-colored. The longer and more erect ears distinguish the white llama near the middle of the picture. Longer and denser wool on the head, neck and legs makes the alpaca appear more clumsy, and the neck is not so long nor so straight. Photograph by Hiram Bingham, courtesy of the *National Geographic Magazine*. (Fig. 9.)

**LLAMA PACK-TRAIN**

An unloaded llama pack-train, in Sicuani, Peru, with the Indian drivers. Three colors are usually represented, black, brown, and white, with mixed and particolored coats not infrequent. Photograph by G. B. Gilbert, April 10, 1915. (Fig. 10.)

**ALPACAS FEEDING**

Alpacas feeding on bunch-grass pastures near Araranca, Peru, in the Pass of Raya, at an altitude of over 14,000 feet. Several of the lamb-like young animals in the foreground are notably particolored. Photograph by G. B. Gilbert, April 13, 1915. (Fig. 11.)

of the wild species into solid colors, coarse patterns or irregular spots, accompanied by partial or complete albinism and other abnormal features. Great diversity exists among the domesticated cuys in Peru, an example of which was noted at an isolated Indian house at Machu Picchu in May, 1915. With less than a score of animals there were white, black, brown and gray coats and four shades of red and buff, including a dark mahogany, a paler red, a bright buff and a dull buff, also a pale buff gray, distinct from a black and white gray. Red eyes were noted with buff and white coat, a gray and white coat, and a coat that was entirely black, except for a white stripe on the face. Some individuals were rough, with the hair turned in all directions, and some had lop-ears. More extended and detailed investigation has been given to the color variations of guinea-pigs than to those of any other animal, and the chief authorities in this field have stated the following general conclusion:

"It can be stated, therefore, with probable correctness, that the guinea-pig has undergone in domestication more extensive variation in color and coat characters than any other mammal, and that this variation has occurred almost if not quite exclusively under the tutelage of the natives of Peru. This conclusion points either to a great antiquity of the guinea-pig as a domesticated animal or to more rapid evolution by unit character variation than by other natural processes."[1]

In addition to the llama, alpaca and cuy, the ancient inhabitants of the tablelands are known from the evidence of remains found in ancient cemeteries to have had at least two very distinct types of native dogs, one like a shepherd dog, described by Nehring as *Canis ingae pecuarius*, and another which is compared with a bulldog, *Canis ingae molossoides*. In the warmer valleys, according to von Tschudi, the small hairless house-dog, *Canis caraibicus*, was the prevailing type. The name *perros chinos*, applied to the hairless dogs in Peru, instead of indicating a Chinese origin, may correspond to such expressions as "house-dogs" or "lap-dogs" in English, *china* being a word for woman in the Quichua language.

The fact that the ancient Peruvians and their neighbors had several domesticated animals while the Indians of other parts of America had only dogs, has led some writers to consider the Peruvian tablelands, instead of the warmer valleys, as the original seat of development of the ancient Peruvian civilization. It has long been supposed that a pastoral state preceded the development of agriculture in the Old World, an idea borrowed from the traditions of the Jews, Greeks, and other Mediterranean peoples.

It is possible, however, that the pastoral nations of antiquity secured their domesticated animals from their agricultural neighbors whose crops also they eventually adopted, just as our western hunting Indians began to keep horses, cattle and sheep many years before they settled down to farming. Dogs might be domesticated by savages, but such animals as sheep, cattle, horses, camels, and llamas, seem much more likely to have been domesticated by settled agricultural peoples, than by nomadic hunting tribes. Hunting tribes were numerous in America, and many had adopted only one or two crops, but there were no strictly pastoral people, none who relied on domesticated animals instead of on plants. The ancient Peruvians, who went farthest in the domestication of animals, had also the most highly developed agriculture, the most numerous crops and the most specialized methods of farming.

[1] Castle and Wright. Studies of Inheritance in Guinea-pigs and Rats, Pub. 241, Carnegie Institution, Washington, p. 6.

That any definite evidence of "immense antiquity" can be drawn from the domesticated animals of the ancient Peruvians is not of course to be expected. The most that may be possible is to gain relative ideas of the antiquity of domestication in America and in the Old World. The opportunities of such comparisons are better with plants because of the much greater number of domesticated species. From such considerations as seedlessness and wide divergence from the nearest wild relatives, the series of American cropplants appears to be older than the "Old World" series.

---

## Do Birds Show a Monogamous Instinct?

Recent numbers of *Condor* have contained several articles on the marital tie in birds, even discussing the moral issue involved, constructing a sort of bird morality. The contributors do not appear to have settled the question. L. H. Miller, whose article is quoted in part as follows, makes the suggestion that seasonal mating may be necessary to maintain the vigor of the race.

"In the *Condor* for October, 1918, Mr. F. C. Willard contributes a most stimulating article dealing with the question, 'Do birds mate for life?' In support of his affirmative contention he brings forward some observations resulting from his extended field work in southern Arizona.

"His article is good and the facts recorded are unimpeachable. The interpretation of facts, however, introduces the human element into science, and hence offers a basis for divergence of honest opinion. It is not my desire to dispute Mr. Willard's conclusions but to offer, wholly in good faith, some remarks in support of the opposite side of the question, so that each reader may be his own judge, jury, and court of appeal.

"My first contention is that a bird's activities are almost wholly the result of instincts. These instincts are racial characters and are transmitted from generation to generation, no less truly, though perhaps more variably, than is color, size, or wing area.

"My second contention is that instincts are dependent for their stimulus upon the physiological condition of the animal. Recent experiments on internal secretions have been performed by the transplantation of reproductive glands or by the infusion of tissue extracts directly into the blood stream. These experiments have some bearing upon our problem in that they go to prove that plumage differences between the sexes of poultry are directly controlled by the presence in the body of these germ cells, and that many instinctive acts are dependent, for their immediate stimulus, upon the activity of these glands. A young capon in whose body the ovaries of a hen are grafted will develop the feathering characteristic of the hen. The capon, without the engrafted ovaries, will develop almost as the normal male. A normal female rabbit, treated by hypodermic injection with the extract of foetus in normal salt solution, will pluck the fur from her breast and build a nest as though expecting a litter of her own young, though none are developing.

"The theorist, however, feels it proper to ask the question: Are there not biologic reasons why a seasonal readjustment of the marital relation would prove advantageous to the race? If a protracted effort is required each season before a mate is obtained, the less virile bird will go unmated. Would not the result average better for the maintenance of tone in the race? Whatever else may be claimed for the principle of sexual selection, it seems to be more or less vital to racial vigor. Seasonal recurrence of the selective process would then be classed as a sort of protective adaptation in a class of animals showing abundant specialization in other respects.[1]

---

[1] Loye Holmes Miller, The Marital Tie in Birds. *The Condor*, vol. 21, March-April, 1919.

# TWINNING IN ALFALFA

W. SOUTHWORTH

*Associate Professor; in Charge of Plant Breeding Investigations, Manitoba Agricultural College, Winnipeg, Canada*

DURING our Alfalfa investigations in the season of 1918, the twin hybrid seedlings as illustrated in Fig. 12 appeared. As this is the first time that twinning in alfalfa seed has been noticed in our work, it is thought that a short account of the parentage of the plants giving rise to the twins may be of interest to other investigators who may possibly have had a similar experience.

In raising alfalfa hybrids, the method practiced in this department is first to germinate the seeds in small quantities in open pans, then to transfer the sprouted seeds to prepare soil in flower pots of shallow flats. Finally, after the plants are sufficiently well developed, they are planted out in plots in the open field. It will be seen that this system enables the worker to note any peculiarities which may arise during actual germination, which might otherwise pass unnoticed. The parent of the twins shown in Fig. 13 is the recent progeny of a series of crosses commenced in the summer of 1911.

### THE ORIGINAL CROSS

The first cross of the series was made between alfalfa as the female parent and Black Medick as the male parent, from which, in 1912, twenty-four $F_1$ plants were raised.[1]

### THE SECOND CROSS

In 1913 a plant of the $F_3$ generation of the original cross was crossed with pollen from White Sweet Clover. From this second cross, five $F_1$ plants were raised, four of which produced a few seeds; the fifth plant was totally sterile. Many attempts were made to induce this plant to produce seed, both by selfing and by back-crossing with both original parents, but all efforts proved futile, the plant remained sterile throughout. In order to perpetuate this plant, cuttings were taken from it in 1914 and about twenty plants propagated. Much to our surprise, most of these plants in the following year produced a small quantity of seed. In the spring of 1916 a portion of the seed thus obtained was germinated and eleven plants reared.

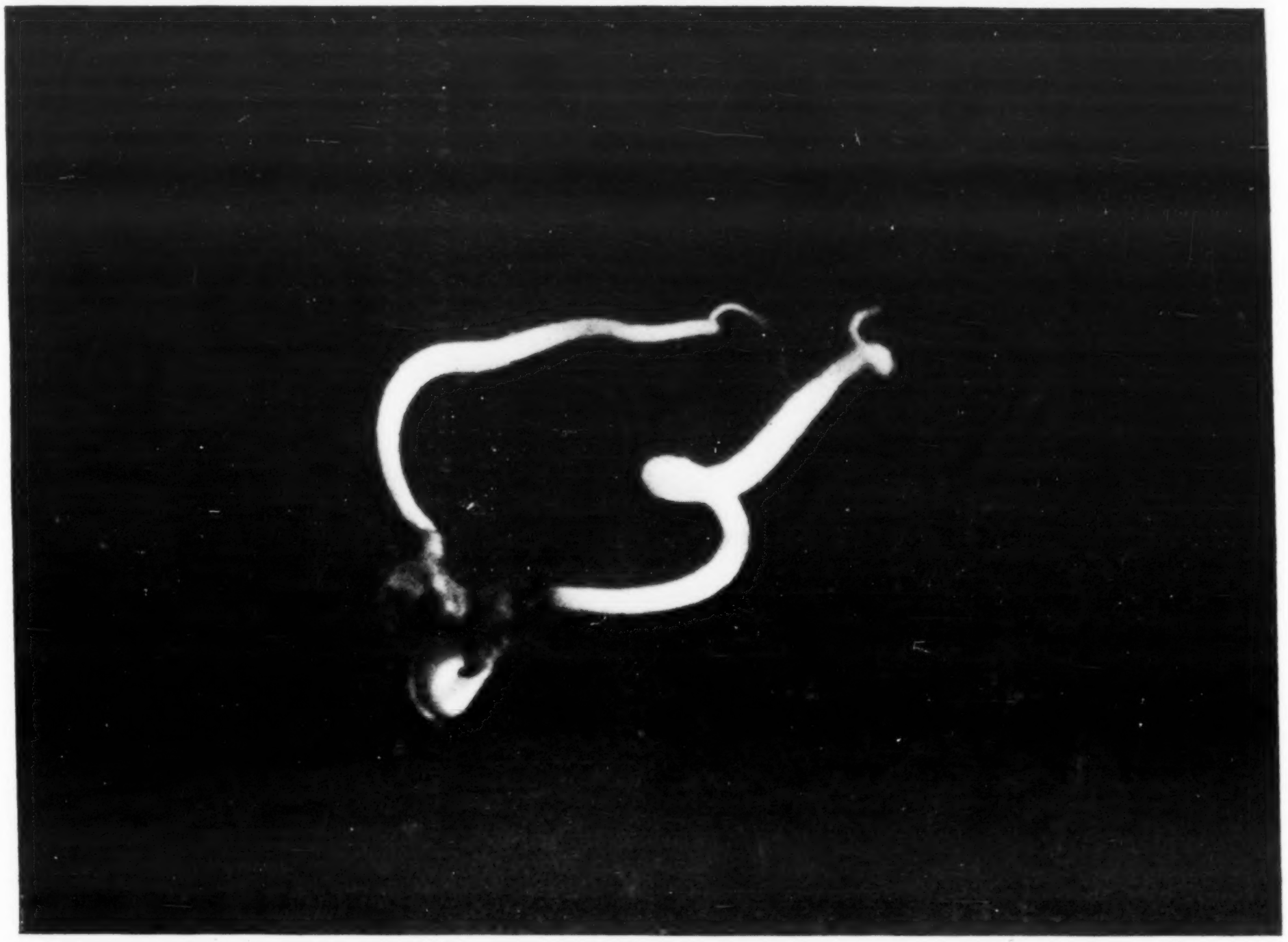
### THE THIRD CROSS

In 1917 two out of the eleven plants were back-crossed, White Sweet Clover being again used as the male parent. From this cross seven $F_1$ plants were raised, one of which produced forty-two seeds, one of these seeds producing the twins as herewith illustrated. (Fig. 13.) In addition to this pair of twins, two other pairs were found. These two pairs likewise descended from the same original cross as the first pair, but the subsequent crossings were both different. In one case the parent which produced the twin seed was obtained by inter-crossing two $F_3$ plants from the original cross. In the other case the parent of the twins was obtained as a result of back-crossing an $F_2$ plant from the original cross, using Black Medick as the male parent.

### SUBSEQUENT BEHAVIOR OF TWIN SEEDLINGS

Of the first pair of twins, one produced a strong healthy plant and the other died from exposure. The remaining two pairs developed into strong vigorous plants, and, though the members of each pair varied somewhat in size, yet each pair seemed to be quite identical in botanical characteristics. Of the five surviving plants, four produced a few seeds which will be used for further investigation.

[1] See "Alfalfa Hybridization," JOURNAL OF HEREDITY, vol. v, No. 10, pp. 448–457.



**TWINNING IN ALFALFA**

Two alfalfa seedlings obtained from a single seed. Enlarged about four times the natural size. (Fig. 12.)

**TWIN ALFALFA PLANTS**

These plants, about three months old, were produced by one seed. This seed was obtained from a mother plant which was the $F_1$ progeny of an inter-cross between two $F_3$ plants obtained by crossing Alfalfa ♀ with Black Medick ♂. (Fig. 13.)

**BRAZILIAN PLANT SIMILAR TO TOBACCO**

It is difficult to get a horse to go by *Solanum bullatum* until he has had a good chew. It is an excellent forage plant and should be more widely cultivated. (Fig. 14.)

# A FORAGE PLANT FROM THE SOLANACEAE FAMILY

## A Plant That When Young Is Very Similar to Tobacco and Much Appreciated by Horses in Brazil

BENJAMIN HARRIS HUNNICUTT, M.S.A.
*Director of the Lavras Agricultural School, Lavras, Brazil*

---

LOOKING through the books on forage plants under common cultivation none are to be found belonging to the genus Solanum, nor to any other subdivisions of the Solanaceae family. The following notes on the *Solanum bullatum*, a promising forage plant of this family found wild in many parts of Brazil, are made from the standpoint of the agronomist and not so much of the botanist. Some time ago our attention was called to this plant by the articles in the Brazilian papers by the botanist, Dr. Alvaro A. da Silveira, whose work with little known plants suitable for forage purpose has been notable.

This plant has many common names in Brazil, differing in each state. In Minas it is called *capoeira branca* (white bush) and *fructa de pomba* (dove fruit). The first name is given on account of the whitish tinge of the leaves, especially as the plant gets older and grows into a small tree. The second name is given to it because the wild doves are very fond of the fruits; indeed, it is very hard to get seeds of the plant because the birds pick them before they are ripe. In São Paulo the common name is *cuvetinga*, which is probably the native or Indian name for it. In the State of Rio de Janeiro it is called *fumeiro*, or tobacco plant, because as a young plant it is very similar to the tobacco plant. It is also found in the State of Paraná and possibly in other states.

As a young plant it grows up as a bush with a number of stems coming up from the ground, but when older it is often found with only one trunk. Where it grows isolated it spreads quite widely (see Fig. 15), but when growing in very rich ground and along with other plants it reaches a height of 15 to 20 feet.

After a forest is cut off and the land turned over, among the first plants to appear is the *Solanum bullatum*, and its usefulness as a forage plant came to be noticed in that way. As soon as fresh land is cleared it is planted to corn. When the corn crop is harvested the cattle are turned in to eat off the stalks, and as this plant is generally to be found it was noticeable to what extent the cattle sought after it. When riding over our land it was often noticed that a horse would leave the road to try to get a nibble at this plant. One horse we owned could safely be ridden through a cornfield without his biting the corn, but it was difficult to get him past one of these plants without getting his mouth full. So far as we know no toxic effects have been observed from cattle or horses eating this plant. We were informed that, while it was not injurious to horses, it was poisonous to cattle, but this information is incorrect, for cattle are just as fond of it as horses and no ill effects are noticeable with either.

If it should be cultivated it would have to be planted close enough together in the rows to be utilized before it got too big or woody. It is perennial, but as a forage plant would have to be used as an annual. It will sprout from a cut trunk, but this would probably not prove to be of advantage agri-

**BRAZILIAN FORAGE PLANT**

This plant when young resembles so much the tobacco plant that it is called "fumeiro" in the State of Rio de Janeiro. Horses and cattle are devoted to it, and it seems to agree with them. Chemical analysis shows an unusually high protein content. (Fig. 15.)

culturally. We have not been able to make fair tests of it as a cultivated plant, due to the difficulty of obtaining seed. Although it is common on our farm, it is very difficult to obtain even a small supply of seed. Several small quantities of seed have been sent to Hon. David Fairchild of the Foreign Seed and Plant Introduction Service of the Plant Industry Bureau. Possibly in the United States it will be easier to give it a trial.

As seen by the illustrations that accompany this article, this plant grows on hard, comparatively poor ground. The smaller, more bushy plant was found in the middle of the farm road on hard-packed ground. Nevertheless this plant is considered as one requiring fertile land, and is generally found on the better soils.

As to climate, Lavras is semi-tropical, our range of temperature being from 30° to 90° F., with an average of about 60°. But we saw this plant growing in the State of Paraná upon a mountain, where the cold is intense. How much frost it would stand we cannot say.

As to chemical analysis this plant reveals a very pleasant surprise. Its high protein content is very unusual. It is higher than that of most leguminous crops.

The analysis of the Secretary of Agriculture of Bello Horizonte is as follows:

| | *Per cent* |
|---|---|
| Moisture | 10.468 |
| Ash | 9.980 |
| Protein | 23.920 |
| Fats | 3.164 |
| Cellulose | 26.780 |
| Non-nitrogenous ext. | 25.688 |
| Total | 100.000 |

The analysis of the U. S. Department of Agriculture is as follows:

| | *Leaves, per cent* | *Branches, per cent* |
|---|---|---|
| Moisture | 8.36 | 7.04 |
| Ether extract | 2.29 | 0.59 |
| Protein | 20.88 | 14.06 |
| Crude fiber | 28.03 | 37.45 |

This plant is highly appreciated by cattle and horses and would probably be a feasible crop for hay if it could be cut and prepared before getting too woody.

There is another of this genus, *Solanum grandiflorum*, or *the fruit of wolf*, which has nearly 20% protein, which grows in much poorer land than the *Solanum bullatum*, and is eaten by the cattle in Brazil. This plant resembles a gigantic egg-plant. The tree has spines like the egg-plant and the fruits are similar also. The plant grows into a spreading tree about 8 to 10 feet high and will flourish on the poorest clay uplands. To us it does not appear to have much possibilities as an agricultural plant, but it seems to be worth more careful study and experiment to see what can be done with it. Lately we have had several inquiries about this plant from other parts of Brazil, and it is possible that soon something will be done with it in a practical way. We shall try and interest the government experiment stations in its cultivation and use.

---

## An Old Issue Especially Wanted

Volume III, No. 1, the first quarterly issue of the American Breeders' Association (now the JOURNAL OF HEREDITY), is especially desired. Anyone having a copy for sale will please communicate. JOURNAL OF HEREDITY, Box 472, Eleventh Street Station, Washington, D. C.

**BRAZILIAN FORAGE PLANT**

This plant when young resembles so much the tobacco plant that it is called "fumeiro" in the State of Rio de Janeiro. Horses and cattle are devoted to it, and it seems to agree with them. Chemical analysis shows an unusually high protein content. (Fig. 15.)

culturally. We have not been able to make fair tests of it as a cultivated plant, due to the difficulty of obtaining seed. Although it is common on our farm, it is very difficult to obtain even a small supply of seed. Several small quantities of seed have been sent to Hon. David Fairchild of the Foreign Seed and Plant Introduction Service of the Plant Industry Bureau. Possibly in the United States it will be easier to give it a trial.

As seen by the illustrations that accompany this article, this plant grows on hard, comparatively poor ground. The smaller, more bushy plant was found in the middle of the farm road on hard-packed ground. Nevertheless this plant is considered as one requiring fertile land, and is generally found on the better soils.

As to climate, Lavras is semi-tropical, our range of temperature being from 30° to 90° F., with an average of about 60°. But we saw this plant growing in the State of Paraná upon a mountain, where the cold is intense. How much frost it would stand we cannot say.

As to chemical analysis this plant reveals a very pleasant surprise. Its high protein content is very unusual. It is higher than that of most leguminous crops.

The analysis of the Secretary of Agriculture of Bello Horizonte is as follows:

| | *Per cent* |
|---|---|
| Moisture | 10.468 |
| Ash | 9.980 |
| Protein | 23.920 |
| Fats | 3.164 |
| Cellulose | 26.780 |
| Non-nitrogenous ext. | 25.688 |
| Total | 100.000 |

The analysis of the U. S. Department of Agriculture is as follows:

| | *Leaves, per cent* | *Branches, per cent* |
|---|---|---|
| Moisture | 8.36 | 7.04 |
| Ether extract | 2.29 | 0.59 |
| Protein | 20.88 | 14.06 |
| Crude fiber | 28.03 | 37.45 |

This plant is highly appreciated by cattle and horses and would probably be a feasible crop for hay if it could be cut and prepared before getting too woody.

There is another of this genus, *Solanum grandiflorum*, or *the fruit of wolf*, which has nearly 20% protein, which grows in much poorer land than the *Solanum bullatum*, and is eaten by the cattle in Brazil. This plant resembles a gigantic egg-plant. The tree has spines like the egg-plant and the fruits are similar also. The plant grows into a spreading tree about 8 to 10 feet high and will flourish on the poorest clay uplands. To us it does not appear to have much possibilities as an agricultural plant, but it seems to be worth more careful study and experiment to see what can be done with it. Lately we have had several inquiries about this plant from other parts of Brazil, and it is possible that soon something will be done with it in a practical way. We shall try and interest the government experiment stations in its cultivation and use.

---

## An Old Issue Especially Wanted

Volume III, No. 1, the first quarterly issue of the American Breeders' Association (now the JOURNAL OF HEREDITY), is especially desired. Anyone having a copy for sale will please communicate. JOURNAL OF HEREDITY, Box 472, Eleventh Street Station, Washington, D. C.

# THE RACIAL LIMITATION OF BOLSHEVISM

## An Analysis of European History Shows That Nordic Countries Have Been Extremely Free from Periods of Anarchy

FREDERICK ADAMS WOODS

*Lecturer on Biology, Massachusetts Institute of Technology*

IS THE Anglo-Saxon temper by nature averse to Bolshevism? Let us hope so. Do the facts of history help us to sustain such a belief? By and large, it would seem that they do. Bolshevism, while it is not anarchy in theory, leads to anarchy and to that extent is comparable with anarchistic periods in the past. These are all well known and recorded in our histories, and it is certainly not without interest and probably not without profitable suggestion to examine medieval and modern European history from a broad point of view and see if there is any notable predisposition towards or against anarchy that can be identified with racial differences. Race is, of course, neither identical with language nor with nationality. Yet anthropologists all recognize, as distinct from the Slavic, and from the Latin or Mediterranean, an Anglo-Teutonic or Nordic race. Scandinavia, northern Germany, Denmark, Holland, and Great Britain are to be considered as the present chief abiding places of this Nordic race—tall, blonde, dolichocephalic, enterprising, and masterful, with capacity for organization and practical thought.

These statements need not involve such controverted matters as the relative superiority of different races or questions of migration and mixture. At least the Russian peasant is different racially from the Dane or the Englishman of the same social class, and our question is whether the history of the chief Nordic countries is different from the history of Russia, the leading Slavic country in the amount of anarchistic tendency revealed.

No material has been collected for a wide comparison including all the Slavic nations, but, as far as Russia is concerned, it would seem that long periods of anarchy are nothing new, as the following instances prove. These are all taken directly from condensed estimates which were compiled for "The Influence of Monarchs,"[1] and are published in the appendix to that work to show the varying material conditions of fourteen European countries. They were not made with any idea of a study in proportionate anarchism.

In Russia, beginning with the minority of Ivan IV, 1538, there were nine years of intrigues, uprisings, and disorders. The Tartars harried the empire, and the state treasury was plundered. Treasons and conspiracies marked the brief period, April 13 to June 1, 1605. In 1606, for four years until 1610, general confusion again reigned. Russia was invaded by the Poles, and the Tartars plundered the border. In 1610 an interregnum commenced, with anarchy for two years, followed by the expulsion of the Poles. Civil disorder, however, continued until 1613. The public treasury was again plundered, as in the previous century. Again during the minority of Ivan and his brother, Peter the Great, 1682 to 1689, occurred another period of confusion and massacres. Russia during the eighteenth century was chiefly under the domination of Peter the Great and Catherine the Great and there were no notable periods of anarchy.

The above is not presented as a profound and accurate historical investigation into Russian anarchism. These

[1] Woods, Frederick Adams: "The Influence of Monarchs," New York, 1913, pp. 359–366.

periods were not, of course, entirely devoted to absolute lawlessness. To measure them intensively would be a long drawn-out labor. But these words and these descriptions are undoubtedly such as well describe the periods to which they are attached. They are merely the phrases used by standard historians and here reproduced just as found. No modifying or ameliorating clauses have been omitted.

Now, if we turn to a summary of the history of England during a similar period (c. 1461—c. 1801), we find that there are no periods in which the word anarchy is used by historians as applicable to a description of the condition of national affairs, or to a characterization of the spirit of the times. Earlier than this we do find an occasional period of anarchy, as, for instance, under the reign of Stephen (1135–1154), the brief uprising under Wat Tyler (1381), which lasted only two or three weeks, and Jack Cade's Rebellion, during the reign of Henry VI. But these are the only instances during the four centuries that followed the Norman Conquest. No materials are at hand to enable me to state just how much anarchy took place in Russia during these earlier times, but I imagine that there was much more than in England.

Scotland was long a backward country. Civil wars, border raids, plots, conspiracies, turmoil, and unsettled conditions are encountered frequently enough in the fifteenth and sixteenth centuries, but all this is different from anarchy, and I do not find the word anarchy used at all by historians as applicable to early Scottish history. It seems rather that they always kept to group or clan formation. The organization of the whole was broken into parts, but the organizations remained and the lower orders always followed their leaders. The history of Scotland shows that it was not merely because Russia was a backward country that she indulged in so much anarchy.

Sweden, a good example of a Nordic country, shows no periods of anarchy during these centuries.[2] General discontent and suffering, disorder, religious and personal warfare, misfortune and poverty, lethargy, and even national humiliation, are some of the descriptive phrases picturing the dark aspects of Sweden's history, which occurred from time to time, but never the word anarchy.

Denmark in its history is nearly free from anything approaching extreme lawlessness. We find only during the interregnum, 1533–1534, civil wars, violences, and cruelties. The same may be said for Holland. Party struggles, persecutions, financial exhaustion were not unknown, but except for the brief period, 1747–1751, characterized by internal commotion and some uprisings, there were no lapses on the part of the Dutch from the maintenance of organized government.

Also Prussia has scarcely ever before known the meaning of being without a recognized and ordered government. During most of her history it has been her fate to be under strong monarchical leadership. There were only two distinctly weak Hohenzollerns from 1415 to the death of Frederick the Great in 1786. Under George William (1619–1640), during the Thirty Years' War, the nation was brought to bankruptcy, political dissolution, and internal lawlessness.

In this question of anarchistic tendencies as shown in history, France presents an intermediate position between Slavic Russia and the strictly Nordic countries just described. The anarchy of the French Revolution is, of course, enough in itself to place France below the Nordic countries in a record for good behavior on law-abiding grounds. There were not many periods of anarchy earlier than this unless we go back to ages earlier than are here considered. Subsequent to the middle of the fifteenth century there was at least one time during the reign of Henry III when bands of lawless adventurers overran the land.

Thus a survey of Anglo-Teutonic history from the middle of the fifteenth century to the beginning of the nineteenth brings out the fact that Nordic races have not been appealed to by an-

[2] 1525–1792, *ibid.*, pp. 354–358.

archistic temptations. The racial elements in the make-up of Russia are mainly Slavic. They are of the Alpine or brachycephalic type. The true Russians constitute nearly three-fourths of the population of Russia, the rest are chiefly Letto-Lithuanians, Poles, Jews, Finns, Turco-Tartars, and Mongols. They have indulged in much anarchy in the past. Historical evidence strongly suggests that there is something inherent in the temperament of the Slav causing him to yield much more easily than his Nordic neighbor to the temptations of mob violence. Let us hope that now is another time when nature will assert itself as stronger than nurture and that Bolshevism will find itself delimited on the Anglo-Saxon frontiers.

---

## Army Tests Reveal the Vast Differences in Mankind.

The comparison of negro with white recruits reveals markedly lower mental ratings for the former. A further significant difference based on geographic classification has been noted in that the northern negroes are mentally much superior to the southern.

In a certain training camp 221 inapt soldiers, belonging to a negro regiment of pioneer infantry, were referred by their commanding officer for special psychological examination. Nearly one-half (109) of these men were found to have mental ages of seven years or less. *The army nevertheless had been attempting to train these men for military service.*

In another instance some 306 soldiers from organizations about to be sent overseas were designated by their commanding officers as unfit for foreign service. They were referred for psychological examination with the result that 90% were discovered to be ten years or less in mental age, and 80% nine years or less.

The utilization of methods of mental testing by the army has at once increased military efficiency by the improved utilization of brain power and demonstrated the applicability of the group method of measuring intelligence to educational and industrial needs. The army methods, although not adapted to the usual educational or industrial requirements, can readily be modified or used as a basis for the development of similar procedures.

There are abundant indications that the future will witness the rapid development of varied methods for improving scientific placement and vocational guidance. It is highly probable that grading in the public schools, in colleges and professional schools will shortly be based in part upon measurement of mental ability instead of exclusively on measurements of acquisition.—*Science*, *March* 14, 1919.

# INHERITANCE OF CONTINUOUS AND DISCONTINUOUS VARIATIONS

DR. F. B. SUMNER has been making some studies of inheritance in deer-mice. Writing on the question of discontinuous variation, his conclusions do not support the views of Bateson and DeVries.

"The dorsal tail-stripe is entirely lacking in a certain strain of my mutants. This stripeless condition is recessive to the striped one. In crosses with normal mice, the stripe appears in its full size and intensity. Nevertheless, the stripe itself was shown in the preceding pages to vary from race to race and from one individual to another. *And these variations, both racial and individual, were found to be hereditary.*

"The case, of course, is parallel to that of Castle's hooded rats. Since 'hoodedness' is recessive to 'self-color' and reappears in one fourth of the $F_2$ generation. Castle argues that it is dependent upon a single unit factor. Nevertheless, this factor itself presents hereditary variations in 'potency,' since it can be modified indefinitely by selection. The Mendelian counter-argument is that 'hoodedness' behaves as a unit character in certain crosses merely because there is some one factor without which it cannot manifest itself *at all.* The variability in its *degree of manifestation* is due to the fact that the hooded pattern is modified by the action of a number of independent cumulative factors. The argument seems a bit scholastic, but we must admit that it is logical and consistent." Dr. Sumner states his own conclusions in part as follows.

"All of these differences, structural and pigmental, are found to be differences of degree, revealed through a comparison of mean or modal conditions rather than of individual animals. In comparing the less divergent of these races with one another, the frequency polygons for any given character overlap broadly.

"These subspecific differences, and even the minor differences which distinguish one narrowly localized sub-race from the parent form, are found to be hereditary, as evidenced by their persistence when environmental conditions are interchanged.

"The gradations in certain of these characters by which individuals of the same race differ from one another are found to be strongly hereditary.

"Hybrids between even the most divergent of these four races are predominantly intermediate in character, both in the $F_1$ and the $F_2$ generations. In both of these generations a wide range of variability is exhibited, which, however, is little if any greater in the $F_2$ than in the $F_1$.

"In contrast to the sensibly continuous variation and sensibly blended inheritance shown in respect to these subspecific characters, is the behavior of certain 'mutations.' Here we meet with typical discontinuous variation, and inheritance of the strictly alternative or Mendelian type. It is insisted that the burden of proof rests upon those who contend that these two types of variation and inheritance are reducible to a single category—that of discontinuity. Anything like a proof of this contention appears to be thus far lacking."[1]

[1] Sumner, F. B., Continuous and Discontinuous Variations and Their Inheritance in Peromyscus—III. In *American Naturalist*, vol. 52, August-September, 1918.

## WHAT GENETICS IS

**"An exact determination of the laws of heredity," says William Bateson, "will probably work more change in man's outlook on the world, and in his power over nature, than any other advance in natural knowledge that can be clearly foreseen."**

To gain this knowledge is the object of the science of genetics, which proceeds, in practice, largely by means of plant breeding and animal breeding for the reason that heredity is less complicated in these organisms than in Man, and its operation can be more easily made out. The knowledge so gained finds its application in methods for the improvement of cultivated plants and domesticated animals and, most important of all, in the improvement of the human race through the science of eugenics, which was defined by its founder, Francis Galton, as "the study of agencies under social control that may improve or impair the racial qualities of future generations, either physically or mentally."

## THE AMERICAN GENETIC ASSOCIATION

is an incorporated organization, coöperative in nature. It is devoted to promoting a knowledge of the laws of heredity and their application to the improvement of plants, animals, and human racial stocks.

It owns the JOURNAL OF HEREDITY, which is published monthly and sent free to each member.

## REQUIREMENTS FOR MEMBERSHIP

Membership is composed of men of science, teachers, publicists, physicians, clergymen, parents, students, horticulturists and breeders of live stock, etc., throughout the world.

Subject to the approval of the council, any person interested in the improvement of the human race or the creation of better varieties of plants and animals, is eligible for membership.

The secretary will be glad to correspond with those interested, and to send a copy of the magazine for examination.

Annual dues, giving the right to attend all meetings and receive the JOURNAL OF HEREDITY, are $2; life membership is $50.

**If you want to become a member, or if you know anyone who you think is eligible for membership, write to**


**THE AMERICAN GENETIC ASSOCIATION**

**P. O. Box No. 472, Eleventh Street Station Washington, D. C., U. S. A.**